

THE CURRICULUM BOOK OF MASTER OF COMMERCE (M.COM)

Specialization: Finance, Human Resource Management and Marketing

TWO YEARS (FOUR SEMESTERS) PROGRAMME
Choice Based Credit System on Outcome Based Education
(Effective from Session 2020-21)



HARYANA SCHOOL OF BUSINESS
GURU JAMBHESHWAR UNIVERSITY OF SCIENCE
AND TECHNOLOGY HISAR-125001, HARYANA

(YEAR-2020)

THE CURRICULUM BOOK

OF

MASTER OF COMMERCE (M.Com)

Specialization: Finance, Human Resource Management and Marketing

1.1. Vision and Mission of the Haryana School of Business

1.1.1 Vision

The school shall strive to achieve the vision of a globally respected institution engaged in generation of knowledge and dissemination of the same through teaching, research and collaboration with leading business schools, the industry, government and society in the fields of business management studies for the benefits of the economy, nation and the world.

1.1.2 Mission

- i)** Striving to contribute its best in transforming raw brains into effective business leaders ready to contribute towards the emerging frontiers of economic and societal growth.
- ii)** Imparting state-of-the-art knowledge in the field of business and management keeping into the changing requirements of the industry.
- iii)** Ensuring that our students graduate with a sound theoretical basis and wide-ranging practical business cases and problem solving experience.
- iv)** Fostering linkages between the academics, business and industry.
- v)** Promoting ethical research of high quality in the field of business and management.
- vi)** Adopting the best pedagogical methods in order to maximize knowledge transfer to ensure outcome based education in business and management.
- vii)** Inculcating a culture of free and open discussions in the School thereby engaging students in evolving original business ideas and applying them to solve complex business problems.
- viii)** Inspiring an enthusiasm into students for lifelong learning thereby infusing scientific temper, enthusiasm, professionalism, team spirit and business leadership qualities in the students.

- ix) Sensitizing students to look for environmentally sustainable vis-à-vis globally acceptable business solutions.
- x) Upholding democratic values and an environment of equal opportunity for everyone vis-à-vis preparing the students as global humane citizens.

1.2. Vision Programme Educational Objectives (PEOs) of the M.Com Programme

The Programme Educational Objectives of the M.Com Programme are:

- PEO1.** To prepare better employable, socially responsible and ethical citizens by providing them right set of Knowledge which can be to be successfully employed in public and private sector especially in the corporate sectors at national and global levels for better future, who will be able to apply the principles of business and management to evolve, develop and deploy best possible solutions for real world business problems after assessing their economic, environmental, cultural and societal implications.
- PEO2.** To focus on building conviction with impartiality and modesty, create an enabling environment for innovative thought processes and nurture open mindedness, equitability and perseverance by grooming the students for analyzing, evaluating and designing complex business solutions individually or in teams by doing a methodical and in-depth research and analysis in the related business problem domains.
- PEO3.** To build a conducive environment that holistically engages commerce students through an all-encompassing knowledge impartation and mentoring the budding professionals and entrepreneurs of tomorrow with global business leadership qualities and deep economic and societal concerns who can move up in their business professional career or start their own ventures as well.
- PEO4.** To guide the commerce graduates to develop a positive attitude towards ethical and value-based learning and motivate them to take up higher studies and research in the field of business and commerce.
- PEO5.** To groom budding commerce professional, formulate business problems and provide innovative solutions thus molding them into future visionaries and able to produce corporate and academic leaders that are compassionate yet efficient and above all to make them sensitive human

beings who can keep due emotions towards humanity and global diversities.

1.3 Programme Outcomes (POs) of M.Com Programme

The MCom is a highly prestigious business oriented programme of modern times, which prepares the students for taking up corporate and academic challenges in private and public sectors. Accordingly, they are imparted adequate conceptual knowledge and practical training in various functional areas of commerce, comprising Finance, Marketing, Human Resource Development. MCom at HSB is a two years programme divided into four semesters. The programme is aimed at following outcomes:

- PO1. Business Knowledge:** Apply knowledge of business and trade theories and practices to solve business problems.
- PO2. Critical Thinking and Problem Analysis:** Foster Analytical and critical thinking abilities for databased decision-making.
- PO3. Leadership and Business Solutions:** Ability to develop Value based Leadership ability that offers business solutions.
- PO4. Communication and Other Skills:** Ability to understand, analyze and communicate global, economic, legal, and ethical aspects of business.
- PO5. Team Dynamics and Teaching Skills:** Ability to lead themselves and others in the achievement of organizational goals, contributing effectively to a team environment and teaching skills in higher education system.

Programme Specific Outcomes (PSOs) of M.Com. Programme

- PSO1. Environmental Awareness for Sustainability:** Understand the new business models to access the impact of the business solutions in economic, societal and environmental contexts.
- PSO2. Business Ethics and Values:** Apply ethical principles and commit to commerce professional ethics and values for discharging all responsibilities within the laid norms of the business and management practices.
- PSO3. Social Responsibility and Life-long Learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of global business environment dynamics.

1.4 Mapping of Programme Outcomes (POs) and Course Outcomes (COs) of M.Com Programme

	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3
C01								
C02								
C03								
C04								
C05								
C06								
	Overall Mapping Result:							

Note : The Mapping of Programme Outcomes (POs) and Course Outcomes (COs) of M.Com Programme will be done every year independently by the Committee constituted by the Board of Studies and Research by making 360 degree feedback including auditing of previous years question-papers and answer-sheets as well. It will be part of the annual Academic Audit of the Haryana School of Business.

1.5 Important Instructions-cum-Ordinance for Implementing the Outcome based Education Scheme and Syllabus of M.Com Programme

- i) The M.Com programme will be divided into four semesters (two semesters in the first year and two semesters in the second year). Every semester, generally, shall be of 21 weeks of duration inclusive of teaching and examination. Since, University is in five-days a week functioning mode, hence, allotted credits to each and every course of the programme would be duly compensated with extra hours to essentially fulfill the objective of minimum working days, per semester, as prescribed by the UGC for the Universities and Colleges in this connection.
- ii) The course of 05 (five) credits shall be of 100 marks in the ratio of 60% external and 40% internal. If otherwise not specifically mentioned against each course, each course of study, ordinarily, consists of five hours lectures per week per semester and one-hour tutorial per week, per group, per semester.
- iii) Unless and otherwise specified at appropriate places, the division and distribution of marks is as under:

Final/Major Test (External) : 60 Marks

Internal Assessment (Internal) : 40 Marks

Distribution of weightage of 40 marks of Internal Assessment will be as per following details:

Minor Tests : 15 Marks

Attendance & Co-curricular Activities : 25 Marks (Attendance: 05)

(To be announced by the teacher or course coordinator, in the light of expected Course Outcomes in the concerned course, in the beginning of the semester, which may include Attendance, Home-Assignment, Presentations, Live Assignment, Brainstorming, Role Playing, Book Review, Field-Visit, Industrial Visit, Exhibition, Case-Study, Mock-Test, Surprise Test, Rapid-Round Session, Open-Book Test, Live Assignment, Quiz, Business-Game, Group Discussion, Declamation, Extempore, Viva-Voce, etc. However, a teacher or course coordinator will choose at any five components and announce to the class in the beginning of the semester)

- iv)** Each individual course will consist of Maximum Marks as 100 Marks and Passing Marks will be 40 Marks only. However, the aggregate passing marks in a semester will be 50 per cent of the total marks per semester.
- v)** A wide range of assessment types for evaluating students is available for the teachers/ institutions to use for internal assessment. Each assessment type has its distinct utility, advantages and limitations. A suitable compendium of such types needs to be carefully chosen for a particular course depending on its nature, objectives and available resources.
- vi)** The Internal Assessment awarded to a student in any particular course will be based on performance of the students in Two Minor Tests, Attendance and Co-Curricular Activities (which may include Attendance, Home-Assignment, Presentations, Live Assignment, Brainstorming, Role Playing, Book Review, Field-Visit, Industrial Visit, Exhibition, Case-Study, Mock-Test, Surprise Test, Rapid-Round Session, Open-Book Test, Live Assignment, Quiz, Business-Game, Group Discussion, Declamation, Extempore, Viva-Voce, etc.)
- vii)** The internal assessment should be designed with learner attributes in mind. These attributes, which have clear linkages to Programme Education Objectives and Course Outcomes, stem from the taxonomy, should be clearly told to the students in the beginning of the semester.
- viii)** At least, one or two activities of the internal assessment should focus to achieve the 5th or 6th Course Outcome in each course of study in every semester.
- ix)** The students who fail in internal assessment as well as in aggregate will have the option to improve their score in the internal assessment giving a special chance to such students. However, no student will be allowed to improve his/ her score of internal assessment if he/she has already scored 50% marks in aggregate as well as in external examination.
- x)** A student who could not secure 40% marks in external examination of the particular course will have to reappear in the external examination of the respective paper as per university rules in this connection.
- xi)** Unless and otherwise specified at appropriate place for specific course, the instructions to the examiners and students for the External Exam/Major Test of 60 marks will be given as under:

- a) The examiner is required to cover all course outcomes framed for a particular course in a balanced manner while setting nine questions in all. The first question will be compulsory consisting of six short questions covering the entire syllabus.
 - b) In addition, eight more questions will be set comprising two questions from each unit. Wherever possible, the examiner may give a case study that will be equal to one question only.
 - c) The students shall be required to attempt five questions in all selecting one question from each unit in addition to the compulsory Question No. 1. All questions shall carry equal marks. The maximum time allotted for the External Exam/Major Test is 03 (three) hours.
- xii) All courses in 1st and 2nd semesters will be compulsory, whereas, the courses in 3rd and 4th semesters will be compulsory, optional-elective, project-work-report and open-elective as well.
 - xiii) The specific instructions have been given at appropriate places regarding compulsory, optional-elective, project-work-report and open-elective courses depending upon the specializations opted by the students.
 - xiv) If any student gets placement offer, through on-campus placement drive, from any public or private sector organization during 4th semester and willing to join immediately, he or she may opt for In-Company-Project-Work for which detailed guidelines will be notified separately, from time to time, after taking necessary approval of competent authority of the university.
 - xv) This new Scheme and Syllabus of M. Com Programme shall be effective from the academic session 2020-21.
 - xvi) In case of any slip-up in above instructions, the general rules of university ordinance will be applicable if the same is in the interest of students.

1.6 General Course Structure and Credit Distribution in Various Components of Teaching-Learning in the M.Com Programme

1.6.1 Definition of a Credit may be further classified as under:

Type of Teaching Learning Activity and Workload	No. of Credits
05 Hours Lecture (L) per week per semester	04 Credit
01 Hour Tutorial (T) per week per semester but maximum two groups irrespective of number of students	01 Credit

02 Hours Practical (Lab) per week per semester	01 Credit
01 Hour Seminar per week per semester	01 Credit
01 Student Guidance for In-Company-Work-Project	02 Credit
02 Hours per week per semester if a teacher is asked to act as Programme Coordinator	02 Credit
01 Hour per week per semester if a teacher is asked to act as Convener of any Standing Committee for discharge of Departmental work during the semester	01 Credit
06 Hours per week for Preparing Students for Training and Placement Activities through mock assessment, group discussion, personal interviews and workshops/seminars per Semester, if officially assigned to a teacher by the Director/Principal during the particular semester.	05 Credit

1.6.2 Credits for Different Curriculum Components

Semester-Wise Credit Distribution of M.Com Programme			
Sr No	Semester-Wise	Number of Courses	Total No of Credits
1.	1 st Semester	6 Courses	33 Credits
2.	2 nd Semester	7 Courses	30 Credits
3.	3 rd Semester	7 Courses	30 Credits
4.	4 th Semester	5 Courses	25 Credits
		Total	118 Credits
Core and Elective Courses Wise Credit Distribution			
Sr No	Core Courses-Wise	Elective and Open-Elective Courses Wise	Total Number of Credits
1.	78	40	118

1.7 For the purpose of enhancing the current knowledge base, students can also access various online resources (supported by MHRD, Government of India) for their respective courses. These resources are available at:

- <http://nptel.ac.in/courses>
- www.mooc.org
- <https://epgp.inflibnet.ac.in>

1.8 : Scheme and Syllabus of M.Com Programme

The Master of Commerce is a two-year full time programme, which is divided into four semesters. The course structure, viz, the scheme and syllabus of the M.Com Programme is given as under:

SEMESTER-I			
Course Code	Course Title	Workload L-----P-----T	Number of Credits
MC-101	Management Process and Organisational Behaviour	5-----0-----1	05 Credits
MC-102	Business Environment	5-----0-----1	05 Credits
MC-103	Managerial Economics	5-----0-----1	05 Credits
MC-104	Financial Accounting and Reporting	5-----0-----1	05 Credits
MC-105	Business Statistics	5-----0-----1	05 Credits
MC-106	E-Commerce	5-----0-----1	05 Credits
MC-107	Seminar (On Indian Ethos, Computer Applications in Business, Contemporary Issues in Cyber Security and Modern Business)* (Internal)		03 Credits
		Total	33

* Seminar will be organized by a committee of not less than three teachers.

SEMESTER-II			
Course Code	Course Title	Workload L-----P-----T	Number of Credits
MC-201	International Business	5-----0-----1	05 Credits
MC-202	Financial Management	5-----0-----1	05 Credits
MC-203	Marketing Management	5-----0-----1	05 Credits
MC-204	Human Resource Management	5-----0-----1	05 Credits
MC-205	Management and Cost Accounting	5-----0-----1	05 Credits
MC-206	Research Methodology	5-----0-----1	05 Credits
		Total	30

SEMESTER-III			
Course Code	Course Title	Workload L-----P-----T	Number of Credits
MC-301	Corporate Governance and Business Ethics	5-----0-----1	05 Credits
MC-302	Business Legislation	5-----0-----1	05 Credits
	Elective-I*	5-----0-----1	05 Credits
	Elective-II*	5-----0-----1	05 Credits
	Elective-III*	5-----0-----1	05 Credits
	Elective-IV*	5-----0-----1	05 Credits
	Open Elective-I**	5-----0-----1	05 Credits
		Total	30 Credits

* The students are required to choose 04 (four) Elective Courses offered in Semester III by selecting 2 (two) courses each from any two areas of specializations offered. In case, a student opts for core specialization, all the four courses must be opted from single area of specialization.

** In addition to above 04 (four) elective courses, the students are also required to choose one course from the list of Open Elective Courses [other than his/her area of specialization(s)]. In any case, if the nomenclature of the paper is same/similar as opted by the student in any semester that course cannot be opted as open elective course.

The List of Open Elective Papers for Semester III is as follows:

Course Code	Course Title	Workload L-----P-----T	Number of Credits
OE-301	Counseling Skills for Managers	5 0 1	5 Credits
OE-302	Fundamentals of Econometrics	5 0 1	5 Credits
OE-303	Personal Finance	5 0 1	5 Credits
OE-304	Applications of Marketing	5 0 1	5 Credits
OE-305	Export Import Procedures and Documentation	5 0 1	5 Credits
OE-306	Corporate Governance and Business Ethics	5 0 1	5 Credits
OE-307	Indian Ethos and Values	5 0 1	5 Credits
OE-308	Computer Application in Business and Cyber Security	5 0 1	5 Credits
OE-309	Disaster Management	5 0 1	5 Credits

SEMESTER-IV			
Course Code	Course Title	Workload L-----P-----T	Number of Credits
MC-401	Comprehensive Viva- Voce (External)		05 Credits
MC-402	Research Project (optional in lieu of one paper)**	05-----0-----1	05 Credits
	Elective-I*	5-----0-----1	05 Credits
	Elective-II*	5-----0-----1	05 Credits
	Elective-III*	5-----0-----1	05 Credits
	Elective-IV*	5-----0-----1	05 Credits
	Or		
MC-403	In-Company-Project-Work***		20 Credits
		Total	25 Credits

* The students are required to choose 4 (four) Elective Courses offered in Semester IV by selecting 2 (two) courses each from major area of specializations. In case, a student opts for core specialization, all the four papers must be opted from single area of specialization. In any case, if the nomenclature of the paper is same/similar as opted by the student in any semester that cannot be opted again.

** Instructions for Research Project: The following instructions will be followed:

1. Research project, which is optional, should be from major or core area of specialization of the student and shall be in lieu of one paper of his/her major or core area of specialization.
2. Students opting for MC-402 Research Project in the 4th semester will have to register for the project in Semester III itself by submitting a synopsis along with consent of the supervisor in the Office of HSB and to the office of Director/ Principal in case of affiliated institutes by 30th November.
3. Research project will be accepted for submission and evaluation when at least one research paper out of the project work has been published or accepted in a research journal or presented in any national conference/seminar. If a student fails to do so, then he/she has to give the presentation of the research project before a committee constituted by Director, (HSB) in case of HSB and Director/ Principal in case of affiliated institutes.
4. External examiner will evaluate the handwritten Research Project and will conduct viva-voce of 60 marks in the premises of HSB (for HSB students) and in the premises of affiliated institutes (for their respective students).

However, the guide will submit the internal awards out of 40 marks separately on the basis of overall performance of the student in the project.

5. The panel of examiners/experts will be provided by Director, HSB. The internal examiner for assisting the external examiner for evaluation and conducting viva voce will be appointed by the Director, HSB in case of HSB and Director/ Principal in case of affiliated institutes.

*** Instructions for In-Company-Project-Work: The following instructions will be followed:

1. If any student gets placement offer, through on-campus placement drive, from any public or private sector organization during 4th semester and willing to join immediately, he or she may opt for In-Company-Project-Work for which detailed guidelines will be notified separately, from time to time, after taking necessary approval of competent authority of the University.
2. However, such In-Company-Project-Work will be jointly supervised by the Academic Guide (to be nominated by the Director, HSB in case of HSB and Director/ Principal in case of affiliated institutes) and Industry Guide (to be appointed by the competent authority of the concerned organization, who has offered appointment letter to the student and the organization requires to join immediately). The Academic Guide will get two hours per week credit per student maximum up to ten credits in his or her teaching workload during the semester.

The List of Elective Papers for Semester III and IV is as follows...

Finance Area

3rd Semester

Course Code	Course Title	Workload L-----P-----T	Number of Credits
MCF-311	Contemporary Issues in Accounting	5 0 1	5 Credits
MCF-312	Financial Restructuring and Valuation	5 0 1	5 Credits
MCF-313	Financial Statement Analysis	5 0 1	5 Credits
MCF-314	Security Analysis	5 0 1	5 Credits
MCF-315	Foreign Exchange Management	5 0 1	5 Credits
MCF-316	Risk Management and Insurance	5 0 1	5 Credits

4th Semester

Course Code	Course Title	Workload L-----P-----T	Number of Credits
MCF-411	Management of banks and Financial Institutions	5 0 1	5 Credits
MCF-412	Financial markets and Services	5 0 1	5 Credits
MCF-413	Business Taxation	5 0 1	5 Credits
MCF-414	Portfolio management	5 0 1	5 Credits
MCF-415	Financial and Commodity Derivatives	5 0 1	5 Credits
MCF-416	Public Finance	5 0 1	5 Credits

Marketing Area

3rd Semester

Course Code	Course Title	Workload L-----P-----T	Number of Credits
MCM-321	Marketing of Services	5 0 1	5 Credits
MCM-322	Consumer Behavior	5 0 1	5 Credits
MCM-323	Integrated Marketing Communication Strategy	5 0 1	5 Credits
MCM-324	Sales & Distribution Management	5 0 1	5 Credits
MCM-325	Logistics Management	5 0 1	5 Credits
MCM-326	Product and Brand Management	5 0 1	5 Credits

4th Semester

Course Code	Course Title	Workload L-----P-----T	Number of Credits
MCM-421	Retail Management	5 0 1	5 Credits
MCM-422	Rural Marketing	5 0 1	5 Credits
MCM-423	Industrial Marketing	5 0 1	5 Credits
MCM-424	Social Marketing	5 0 1	5 Credits
MCM-425	Digital and Social Media Marketing	5 0 1	5 Credits
MCM-426	Customer Relationship Management	5 0 1	5 Credits

Human Resource Management Area

3rd Semester

Course Code	Course Title	Workload L-----P-----T	Number of Credits
MCH-331	Human Resource Planning	5 0 1	5 Credits
MCH-332	Labour Laws	5 0 1	5 Credits
MCH-333	Management of Industrial Relations	5 0 1	5 Credits
MCH-334	Leadership Dynamics	5 0 1	5 Credits
MCH-335	Compensation Management	5 0 1	5 Credits
MCH-336	Business Negotiations	5 0 1	5 Credits

4th Semester

Course Code	Course Title	Workload L-----P-----T	Number of Credits
MCH-431	Performance Management	5 0 1	5 Credits
MCH-432	Labour Welfare and Social Security	5 0 1	5 Credits
MCH-433	Managing Interpersonal and group Process	5 0 1	5 Credits
MCH-434	Counseling Skills	5 0 1	5 Credits
MCH-435	Organizational Change and Intervention Strategies	5 0 1	5 Credits
MCH-436	Global Human Resource Management	5 0 1	5 Credits

The Detailed Syllabus of M.Com Programme as follows...

FIRST SEMESTER

MC-101 MANAGEMENT PROCESS AND ORGANISATIONAL BEHAVIOR

Time Allowed: 3 Hours

M.M:60

Course Objective: *The objective of this paper is to familiarize the students with basic management concepts and behavioral processes in the organization.*

Course Outcomes:

- CO1:** Students will be able to recall the concepts of management process and organizational behavior.
- CO2:** Students will be able to understand individual and group behavior, and understand the implications of organizational behavior on the process of management.
- CO3:** Students will be able to employ different motivational theories and evaluate motivational strategies used in a variety of organizational settings.
- CO4:** Students will be able to appraise the basic design elements of organizational structure and evaluate their impact on employees.
- CO5:** Students will be able to evaluate how organizational change and culture affect working relationships within organizations.
- CO6:** Students will be able to design strategies to manage individual, group and organizational behaviour.

Course Contents:

UNIT- I

Meaning, nature and scope of management; Management thoughts; Approaches to management: Scientific process, Decisions theory school, Quantitative and system school, Contingency theory of management; Managerial skills; Social responsibility of managers.

UNIT-II

Managerial Functions: Planning - concepts significance, types; Organizing – concept principles, types of organizations, authority responsibility, power, delegation, decentralization, Staffing; Directing (Leading, Motivating and Communicating); Coordinating; controlling, process and techniques.

UNIT-III

Organizational Behaviour: concepts, determinants, challenges and opportunities of OB; contributing disciplines to the OB; Organizational culture and climate; Factors affecting OB; Understanding and managing individual behavior, Personality, Perception, Values, Attitudes and Learning.

UNIT-IV

Understanding and managing group behavior: Interpersonal and group dynamics; Transactional Analysis; Applications of Emotional Intelligence in organizations. Communication: process, models of communication, issues in organizational communication. Organizational Change; to analyze the major concepts of organizational behaviour in business Organizational Development; Conflict Management and Stress Management.

Suggested Readings:

1. Chandan, J.S., *Organizational Behaviour*, Vikas Publications
2. Koontz, H & Wehrich, H., *Management*, Tata McGraw Hill.
3. Luthans, F., *Organizational Behaviour*, Tata McGraw Hill.
4. Robbins, S.P., *Management*, Prentice Hall Ins.
5. Robbins, S., Judge, T. & Sanghi, S., *Organizational Behaviour*, Prentice Hall of India.
6. Stoner, J., *Management*, Prentice Hall of India.
7. Davis, K., *Organisational Behaviour*, Tata McGraw Hill.

Important Instructions for the Course Coordinator and the Examiner:

- The list of cases and specific references including recent articles will be announced in the class at the time of launching of the course by the Course Coordinator.
- The examiner is required to cover all course outcomes framed for a particular course in a balanced manner while setting nine questions in all. The first question will be compulsory consisting of six short questions covering the entire syllabus. In addition, eight more questions will be set comprising two questions from each unit. Wherever possible, the examiner may give a case study that will be equal to one question only. The students shall be required to attempt five questions in all selecting one question from each unit in addition to the compulsory Question No. 1. All questions shall carry equal marks. The maximum time allotted for the major test is 03 (three) hours.

MC-102**BUSINESS ENVIRONMENT****Time Allowed: 3 Hours****M.M:60**

Course Objective: *The objective of this course is to analyze the micro and macro environment of business in coherent and critical manner.*

Course Outcomes:

- CO1:** Students will be able to define and trace all the indicators of micro and macro environment affecting business organizations
- CO2:** Students will be able to identify and illustrate the impact, challenges and opportunities of all environmental indicators on business organizations
- CO3:** Students will be able to apply and demonstrate the gathered knowledge about how the various laws and other national and international policies influence the organizations in order to take proactive measures so that organizational effectiveness is maintained.
- CO4:** Students will be able to distinguish and examine the necessary techniques and skills that help them in handling the organization's global and national issues efficiently.
- CO5:** Students will be able to evaluate and value the importance of environment within which a business organization has to sustain itself successfully
- CO6:** Students will be able to design and develop their approaches and systems in maintaining coherence both at micro and macro level

Course Contents:**UNIT-I**

Indicators of Internal and External Business environment; Environmental scanning and risk assessment; Concepts of Economic systems; New Industrial Policy-1991 and Recent Financial and Economic Reforms, Recent Monetary and Fiscal Policy and their impact on Business Environment.

UNIT-II

Impact of Political, Economic, Social and Technological Environment on the Emerging Sectors of Indian Economy; Public Sector, Private Sectors, Services Sector and SME Sector; Privatization in India; Public Private Partnership; Challenges and Opportunities in the Rural sector.

UNIT-III

Globalization Business Environment; Opportunities and challenges for MNCs in India; Foreign investment in India; Indian Foreign Trade and its Impact on Balance of Payment, Exchange rate Movements and India's Competitiveness in the world economy; World Trade Trends and Economic Integration. Contemporary Issues: Climate change, Food security, Geopolitics Sustainable Development and De-Globalization.

UNIT-IV

Legislations for Social Responsibilities- Consumer protection Act, 1986 and its Amendments, Competition Act, 2002 and its Amendments and Environmental Protection Act, 1986; Foreign Exchange Management Act, 1999 (FEMA) and their influences on the Business Environment.

Suggested Readings:

1. Faisal Ahmed and M. Absar Alam. Business Environment: Indian and Global Perspective, PHI, New Delhi.
2. Cherunilam, Francis, *Business Environment*, Himalya Publishing House.
3. Misra, S.K. & Puri, V.K., *Indian Economy*, Himalya Publishing House.
4. Aswath Thapa, K., *Business Environment*, Excel Books.
5. Bedi S.K., *Business Environment*, Excel Books.
6. Khujan Singh, *Business Environment – Theory and Practice*, IAHRW Publications
7. Paul Justin, *Business Environment*, Tata Mc Graw Hill.
8. Economic Survey, Govt. of India.

Important Instructions for the Course Coordinator and the Examiner:

- The list of cases and specific references including recent articles will be announced in the class at the time of launching of the course by the Course Coordinator.
- The examiner is required to cover all course outcomes framed for a particular course in a balanced manner while setting nine questions in all. The first question will be compulsory consisting of six short questions covering the entire syllabus. In addition, eight more questions will be set comprising two questions from each unit. Wherever possible, the examiner may give a case study that will be equal to one question only. The students shall be required to attempt five questions in all selecting one question from each unit in addition to the compulsory Question No. 1. All questions shall carry equal marks. The maximum time allotted for the major test is 03 (three) hours.

Course Objective: *The objective of this course is to acquaint the students with concepts and techniques used in the field of economics and to enable them to apply this knowledge in business decision-making. Emphasis is given to changes in the nature of business firms in the context of globalization.*

Course Outcomes:

CO1: Students will be able to define the terms associated with managerial economics.

CO2: Students will be able to explain different theories of managerial economics.

CO3: Students will be able to apply the models of managerial economics in business decisions.

CO4: Students will be able to examine the demand and supply forces and their effect on pricing and output related decisions.

CO5: Students will be able to evaluate the effectiveness of various models and theories of managerial economics in demand, supply, production and costs related decision making procedures.

CO6: Students will be able to create the competitive strategies to ensure optimum utilisation of resources.

Course Contents:**UNIT-I**

Theory of demand and consumer equilibrium-utility and indifference curve approach; Demand function; Elasticity of demand and its significance in managerial decision-making; Demand forecasting and its techniques.

UNIT-II

Theory of Cost: Types of cost: production cost, selling cost, R&D Cost, short run and long run cost curves, relation between cost and revenue, break-even point; Economies and diseconomies of scale and scope; Production function : Short term and long run production function, law of variable proportion and return to scale, Iso-quant curves.

UNIT-III

Market Structure and Competition: Price and output determination under perfect competition, monopoly, monopolistic competition and oligopoly.

UNIT-IV

Modern theories of firm: Bamoul's theory of sales maximization, Managerial Theory, Behavioral Theory; National Income: Concept and Measurement.

Suggested Readings:

1. Ferguson, P. R. Rothschild, R. Ferguson G.J. , Business Economics, Palgrave Macmillan.
2. Dwivedi, D.N., Managerial Economics, Vikas Publication.
3. Salvatore, *Managerial Economics in Global Economy*, Thomson Learning.
4. Thomas, C.R. & Maurice S.C., *Managerial Economics*, Tata McGraw Hill.
5. Koutsoyiannis, A., *Modern Economics*, Macmillan

Important Instructions for the Course Coordinator and the Examiner:

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Course Objective: *The basic purpose of this course is to develop an insight of postulates, principles and techniques of accounting and application of financial and accounting information for planning, decision-making and control.*

Course Outcomes:

- CO1:** Students will be able to describe various accounting concepts and principles.
- CO2:** Students will be able to recognize the usefulness of Financial Accounting & Reporting and its applications in the business.
- CO3:** Students will be able to apply the principles, postulates and techniques of accounting for planning and decision making.
- CO4:** Students will be able to differentiate between various types of accounting and reporting practices being followed within the organisation.
- CO5:** Students will be able to appraise the performance of organisations with the help of financial statements presented at the end of the year.
- CO6:** Students will be able to formulate advanced policy structure comprising of all accounting information required for controlling deviations in the performance.

Course Contents:**UNIT-I**

Introduction to Accounting: Meaning, nature and scope, branches of accounting; Generally accepted accounting principles (GAAP); Demand and supply of financial statement information: Parties demanding financial statement information, Conflicts among parties, factors affecting demand for financial statement information.

UNIT-II

Accounting Cycle: Business transactions and source documents, Analyzing transactions, Journalizing and posting transactions, preparing a trial balance, adjusted trial balance and preparation of financial statements of trading concerns. Final Accounts with adjustments.

UNIT-III

The conceptual framework of financial Statements: purpose of the framework, scope and coverage, Qualitative characteristics of financial statements, Concept of capital and capital maintenance. Performa financial statements of corporate entities. Significance of notes to financial statements and accounting policies. Other financial reports: Auditor's report, Directors report and corporate governance report.

UNIT-IV

Quality of earnings: Window dressing, Creative financial practices, impact of extraordinary items, Quality of disclosure in reported earnings. Financial Distress: meaning, indicators, models of distress prediction.

Suggested Readings:

1. Foster, George, Financial Statement Analysis, Pearson Education Incl., Second Edition.
2. Gupta, R.L. and Radhaswamy, M., Advanced Accountancy Sultan Chand & Sons, New Delhi.
3. Shukla, M.C., Grewal, T.S. and Gupta, S.C., Advanced Accounts, S. Chand & Company, New Delhi.
4. Anthony R.N., D.F. Hawkins and K.A. Merchant, *Accounting: Text and Cases*, McGraw Hill
5. Jawahar Lal, Accounting Theory and Practice, Himalaya Publishing House.

Important Instructions for the Course Coordinator and the Examiner:

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Course Objective: *The objective of this course is to make students learn about the applications of statistical tools and techniques for decision making.*

Course Outcomes:

CO1: Students will be able to recall different terms used in statistics.

CO2: Students will be able to understand the different methods used in statistics.

CO3: Students will be able to apply the knowledge of statistics in their future studies as well as in corporate sector also.

CO4: Students will be able to analyze the importance of statistics in business.

CO5: Students will be able to evaluate the proficiency of statistical methods in an industry or business.

CO6: Students will be able to assemble the different methods of statistics for the well being of business

Course Contents:**UNIT-I**

Univariate analysis: central tendency, dispersion (theoretical concept); Probability: Introduction, addition theorem, multiplication theorem, conditional probability, Bayes Theorem. Theoretical probability distributions: Binomial, Poisson, Normal Distribution; their characteristics and applications.

UNIT-II

Sampling: probability and non probability sampling methods; Sampling distribution and its characteristics; Hypothesis testing: hypothesis formulation, and testing; Statistical Tests: z-test, t-test, F-test, Analysis of variance, Chi-square test, Wilcoxon Signed-Rank test, Kruskal-Wallis test.

UNIT-III

Correlation analysis: simple, partial and multiple correlations; Regression analysis: simple linear regression model, ordinary least square method. Time series analysis: components of a time series and their measurements and uses.

UNIT-IV

Index numbers: meaning and types, methods for measuring indices, adequacy of indices; Statistical quality control: causes of variation in quality, Control Charts, Acceptance sampling.

Suggested Readings:

1. Gupta, S.P., *Statistical Methods*, Sultan Chand & Sons
2. Anderson, Sweeney and Williams, *Statistics for Business and Economics*, Cengage Learning.
3. Ken Black, *Business Statistics*, Wiley.
4. Levin, Richard I and David S Rubin, *Statistics for Management*, Prentice Hall, Delhi.
5. Aczel and Sounderpandian, *Complete Business Statistics*, Tata McGraw Hill, New Delhi.
6. Hooda, R.P., *Statistics for Business and Economics* McMillan, New Delhi.
7. Heinz, Kohler, *Statistics for Business & Economics*, Harper Collins, New York.
8. Lawrence B. Morse, *Statistics for Business & Economics*, Harper Collins, NY

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Course Objective: *This course exposes students to environment for E-commerce and developing application skills for the same.*

Course Outcomes:

CO1: Students will be able to outline the type of decisions taken at different levels of organisation.

CO2: Students will be able to explain the process of strategic decision making in an organisation.

CO3: Students will be able to apply various tools to assess business environment.

CO4: Students will be able to differentiate among various stages of strategic management starting from strategy formulation to its evaluation.

CO5: Students will be able to evaluate the strategy which best fits in achieving the organisational goals.

CO6: Students will be able to develop a framework of how an organisation actually works by developing policies and strategies.

Course Contents:**UNIT- I**

Technology and Infrastructure for E-Commerce: Framework of E-commerce; Network Infrastructure for E-Commerce – Market Forces Influencing I-way, Network Access Equipment, Public Policy Issues Shaping the I-way; EDI - Applications in Business, Legal, Security and Privacy Issues of EDI; Components of EDI Standards, ASC X12 and EDIFACT.

UNIT-II

E-Commerce and Retailing: Changing Retail Industry Dynamics, Mercantile Models from the Consumer's Perspective, Management Challenges in Online Retailing.

Intranets and Customer Asset Management: Basics of Customer Asset Management, Online Sales Force, Online Customer Service and Support, Technology and Marketing Strategy.

UNIT-III

Intranets and Manufacturing: Integrated Logistics, Agile Manufacturing, Emerging Business Requirements, Manufacturing Information Systems, Intranet-based Manufacturing, Logistics Management. E-Commerce and Online Publishing: Why Online Publishing, Online Publishing approaches, Advertising and Online Publishing. E-Commerce and Banking: Changing Dynamics in the Banking Industry, Home Banking Implementation Approaches, Management Issues in Online Banking.

UNIT-IV

Intranets and Corporate Finance: An Introduction, Financial Systems, Financial Intranets, Software Modules in Financial Information Systems, Human Resource Management Systems, Size/Structure of Financial Software Market.

Lab: Each student is required to develop at least one application of e-commerce.

Suggested Readings:

1. Kalakota & Whinston, *Electronic Commerce: A Manager's Guide*, Pearson Education.
2. Greenstien & Vasarhelyi, *Electronic Commerce: Security, Risk Management and Control*, Tata McGraw Hill.
3. Joseph, *E-Commerce: An Indian Perspective*, Prentice Hall of India.
4. Turbon, et. al., *Electronic Commerce: A Managerial Perspective*, Pearson Education.

Important Instructions for the Course Coordinator and the Examiner:

- The list of cases and specific references including recent articles will be announced in the class at the time of launching of the course by the Course Coordinator.
- The examiner is required to cover all course outcomes framed for a particular course in a balanced manner while setting nine questions in all. The first question will be compulsory consisting of six short questions covering the entire syllabus. In addition, eight more questions will be set comprising two questions from each unit. Wherever possible, the examiner may give a case study that will be equal to one question only. The students shall be required to attempt five questions in all selecting one question from each unit in addition to the compulsory Question No. 1. All questions shall carry equal marks. The maximum time allotted for the major test is 03 (three) hours.

**MC-107 Seminar on Indian Ethos, Computer Applications in Business,
Contemporary Issues in Cyber Security and Modern Business
(Internal)**

Time Allowed: 1 Hour

M.M. : 50

Course Objective: *The objective of this course is to acquaint the students with existing issues pertaining to Indian Ethos and business. Also, inculcating in them the ability of expressing themselves to an audience with poise and self- belief.*

Course Outcomes:

- CO1:** Students will be able to define the concept and scope of the seminar topic of their interest relating to Indian ethos or contemporary issues in business.
- CO2:** Students will be able to review an existing issue related to business that can help them to get ahead.
- CO3:** Students will be able to illustrate the possible managerial relevance and implications of the specific issue they have approached.
- CO4:** Students will be able to appraise the relevance of arguments prepared for the topic under consideration.
- CO5:** Students will be able to defend difference in opinion towards a topic.
- CO6:** Students will be able to develop their presentation skills.

Important Instructions for the Programme Coordinator and the Examiner:

- The list of contemporary topics will be announced in the class and at least one topic will be allotted to each student by the Programme Coordinator.
- The Evaluation Committee duly constituted by the Director/Principal will invite a seminar presentation from each student and the evaluation will be done on the basis of communication skills, contents, delivery, body-language and question-answer handling skills of the student on a proforma duly notified to the students in advance.

SECOND SEMESTER

Course Objective: *The objective of this course is to highlight the international environment, including relationships between business, government, economic groupings and the consumer. The course will also highlight the problems encountered and issues raised in managing overseas business.*

Course Outcomes:

- CO1:** Students will be able to describe the different concepts and terms used in the literature of International Business.
- CO2:** Students will be able to identify the importance of tariffs, theories, modes, foreign exchange market, international organization and strategies.
- CO3:** Students will be able to illustrate and interpret the macroeconomic changes that affect the international business.
- CO4:** Students will be able to examine the recent practices followed across functional areas of international business.
- CO5:** Students will be able to evaluate the strategic alliance, merger and acquisition, joint venture and regulation of international business.
- CO6:** Students will be able to design international business strategies.

Course Contents:**UNIT- I**

International Business: Importance, nature and scope; Management of international business operations – complexities and issues; IT and international business; India's involvement in International Business; Factors affecting International Business: Social and Cultural, Economic, Political, Legal and technological advancement; Globalization - Features and Components, Advantages and Disadvantages.

UNIT- II

Theories of international trade: Classical and modern theories of international trade; Modes of entry into International Business: Exporting, Licensing, Franchising, Contract Manufacturing, Trunk projects, Foreign Direct Investments and Joint Ventures.

UNIT- III

Multinationals (MNCs) in International Business: Issue in investment, technology transfer, pricing and regulations; International collaborations and strategic alliances. Trade barriers: tariff and non-tariff barriers, optimal tariff; Balance of payments; Exchange rate determination.

UNIT- IV

International Economic Institutions: WTO, IMF, World Bank. WTO and India; Regional Economic Integration; Theory of customs union: Partial and General Equilibrium analysis; Emerging markets: BRICS and ASEAN.

Suggested Readings:

1. Korth, Christopher M., *International Business Environment and Management*, Prentice Hall.
2. Ramu, S. Shiva, *International Business: Governance Structure*, Wheeler Publishing.
3. Bhalla, V.K., *International Business Environment and Management*, Anmol Publications.
4. Mithani, D.M., *International Economics*, Himalaya Publishing House.
5. Charles W.L. Hill, *International Business*, Tata MC Graw-Hill.
6. Czinkota, Ronkainen & Moffet, *International Business*, Thomson, South-Western.
7. Daneiels, Radebaugh and Sullivan, *International Business, Environments and Operations*, Pearson Education.
8. V. Sharan, *International Business, concept, environment and strategy*, Pearson Education

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Course Objective: *The purpose of this course is to acquaint the students with the broad framework of financial decision-making in business.*

Course Outcomes:

- CO1:** Students will be able to outline the basic framework of financial management.
- CO2:** Students will be able to explain the role of financial management for financial decision making in business.
- CO3:** Students will be able to apply various theories of capital structure and dividend policy.
- CO4:** Students will be able to examine risk in capital budgeting decisions.
- CO5:** Students will be able to select various sources of finance with evaluation of their cost.
- CO6:** Students will be able to create working capital policy for organization.

Course Contents:**UNIT-I**

Financial Management: meaning, objectives and scope; types of financial decisions, risk-return framework for financial decision –making; Time value of money; Capital Budgeting Decisions: nature, importance and types of investment decision; techniques of evaluating capital budgeting decisions, risk analysis in capital budgeting.

UNIT-II

Capital Structure Decisions: optimum capital structure; theories of capital structure; factors determining capital structure. Sources of long term and short term finance. Cost of Capital: concept and importance; computations of cost of various sources of finance; weighted average cost of capital.

UNIT-III

Working Capital Management: Concept and types of working capital; operating cycle, determinants of working capital, estimation of working capital requirement; working capital policy; Management of cash, accounts receivables and inventories; financing working capital.

UNIT-IV

Dividend Policy: Dividend and its forms, theories of dividend policy and their impact on the value of a firm; types of dividend policy; Corporate Restructuring: Types of business combinations, motives of mergers and acquisitions, valuation of mergers and acquisitions.

Suggested Readings:

1. Van Horne, James C., *Financial Management and Policy*, Prentice Hall of India.
2. Pandey I. M., *Financial Management*, Vikas Publishing.
3. Damodaran, A, *Corporate Finance: Theory and Practice*, John Wiley & Sons.
4. Hampton, John. *Financial Decision Making*, Englewood Cliffs, Prentice Hall Inc.
5. Khan, M.Y. & Jain, P.K., *Financial Management*, McGraw Hill.

Important Instructions for the Course Coordinator and the Examiner:

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Course Objective: *The purpose of this course is to develop an understanding of the underlying concepts, strategies and issues involved in the marketing of products and services.*

Course Outcomes:

- CO1:** Students will be able to recall and describe the fundamental concepts related to marketing.
- CO2:** Students will be able to describe the different approaches of marketing and environment in which marketing systems operate.
- CO3:** Students will be able to demonstrate an understanding of the 4Ps used by the marketers.
- CO4:** Students will be able to examine the upcoming trends of marketing in the ever dynamic business world.
- CO5:** Students will be able to evaluate the marketing strategies and programmes of different products in real world.
- CO6:** Students will be able to design a marketing plan for real world market offering (product/service).

Course Contents:**UNIT 1**

Nature, scope and concept of marketing; Corporate orientations towards the marketplace; Marketing Mix; Understanding 4 A's of Marketing; Marketing Environment and Environment Scanning; Marketing Information System and Marketing Research; Understanding Consumer and Industrial Markets; Market Segmentation, Targeting and Positioning

UNIT II

Product decisions: Product concept and classification, product mix, product life cycle, new product development; Product branding, packaging and labeling decisions; Pricing decisions: Factors affecting pricing decisions, setting the price, Pricing strategies and methods.

UNIT III

Distribution channels and Logistics management: nature, types and role of intermediaries, factors influencing the channel selection, intensity of market coverage; Channel behavior and Organization:

conflict management, vertical marketing system, horizontal marketing system, hybrid marketing system; Logistics management: objectives and major decisions areas of logistics. Promotional and communication decisions: promotion as communication, elements of promotion mix, factors influencing promotion mix, role of advertising, sales promotion, personal selling and public relations

UNIT IV

Holistic marketing: Trends in marketing practices, Internal marketing, Socially responsible marketing, Marketing implementation and control; New issues in marketing-Globalization, Consumerism, Green Marketing, Direct Marketing, Network Marketing, Event Marketing, Ethics in Marketing.

Suggested Readings:

1. Kotler, Philip and Keller, Kevin, *Marketing Management*, Prentice Hall of India
2. Kotler, Philip and Armstrong, G., *Principles of Marketing*, Prentice Hall of India
3. Czinkota & Kotabe, *Marketing Management*, Thomson Learning
4. Ramaswamy, V.S. & Namakumari, S., *Marketing Management: Planning, Control*, Macmillan
5. Kotler, Lane, Keller., *Marketing Management*, Pearson
6. Rajan Saxena, *Marketing Management*, McGraw Hill
7. R. Srinivas, *Case Studies in Marketing- Indian Context*, PHI Learning
8. Stanton, *Fundamentals of Marketing*, McGraw Hill
9. Sontakki, C.N. et al., *Marketing Management*, Kalyani Publishers
11. Kumar, A and Meenakshi, N, *Marketing Management*, Vikas Publishing House Pvt. Ltd.
12. C.K. Prahalad, *The Fortune at the Bottom of Pyramid*, FT Press
13. Matt Haig, *100 Brand Failures*, Kogan Page
14. W. Chan Kim & Renee Mauborgne, *Blue Ocean Strategies*, Harvard Business Review Press

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Course Objective: *The objective of this course is to sensitize students to the various facets of managing people and to create an understanding of the various policies and practices of human resource management.*

Course Outcomes:

CO1: Students will be able to recall the terms associated with Human Resource Management.

CO2: Students will be able to discuss various HR practices used in the business world.

CO3: Students will be able to apply various HR practices.

CO4: Students will be able to compare and contrast HR practices across companies.

CO5: Students will be able to evaluate the effectiveness of HR practices adopted in the organizations.

CO6: Students will be able to create and design the HR strategies related to coping in dynamic business environment.

Course Contents:**UNIT-I**

Concepts and perspectives of Human Resource Management; Human Resources Management in a changing environment; Managerial and operative functions of HRM

UNIT-II

Recruitment, Placement and Retention Strategies; Human Resource Planning; Job Analysis; Methods of Manpower Search; Attracting, Selecting and Retaining Human Resources; Induction and Socialization.

UNIT-III

Training and Development: Manpower Training and Development; Performance Appraisal and Potential Evaluation; Career and Succession Planning; Talent Management.

UNIT-IV

Employee Relations and Compensation Administration: Job Evaluation and Compensation Management; Incentives and Employee Benefits; Employee Welfare; Industrial Relation; Employee Separation Practices, HR Accounting and audit.

Suggested Readings:

1. Aswathappa, K., *Human Resource and Personnel Management*, Tata McGraw Hill.
2. Dessler, G., *Human Resource Management*, Pearson Education.
3. Venkatesh, D.N. & Jyothi P., *Human Resource Management*, Oxford University Press.
4. Bohlander, G. & Snell, S., *Human Resource Management*, Cengage Learning.
5. Patnayak, B., *Human Resource Management*, PHI Learning.
6. Rao, V.S.P., *Human Resource Management*, Excel Books.
7. Cascio, W.Y., *Managing Human Resources*, Irwin-McGraw Hill.
8. Noe, Hollenbeck, Gerhart & Wright, *Human Resource Management*, McGraw-Hill Higher Education

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Course Objective: *The objective of this course is to develop an understanding of basic management science techniques and their role in managerial decision making.*

Course Outcomes:

- CO1:** Students will be able to define the basic concepts in the field of Management Accounting
- CO2:** Students will be able to recognize the contribution of Management and Cost Accounting in quality decision making.
- CO3:** Students will be able to apply various methods and techniques of Management and cost Accounting to optimize the utilization of the resources.
- CO4:** Students will be able to appraise the utility of different methods in finding optimal solutions of the managerial problems.
- CO5:** Students will be able to evaluate the performance and suitability of different methods used for efficient utilization of the resources.
- CO6:** Students will be able to formulate the budgets and interpret the results produced by the applied models.

Course Contents:**UNIT- I**

Management Accounting-Nature, Functions, Objectives and Scope; Financial Accounting vs. Cost Accounting vs. Management Accounting; Role and Responsibilities of Management Accountant in a Business Organization. Cost Accounting: Meaning, cost concepts and classifications.

UNIT- II

Budgetary Control: Definition; Installation of the System; Classification of the Budgets; Behavioural aspects of Budgeting. Standard Costing and Variance Analysis: Concept; Setting of Standards; Analysis of different types of material, labour, overhead and sales variances.

UNIT- III

Marginal Costing and Break even analysis: Cost – Volume- Profit Analysis; Different types of Break-even Points and Charts; Application of Marginal costing to managerial decision making.

UNIT- IV

Responsibility Accounting: Concept and significance; Organisational structure and Decentralization; cost and benefits of decentralization; Responsibility Centers: Cost Centre, Revenue centre, Profit centre and Investment centre; Transfer pricing; Alternative Transfer Pricing Methods. Divisional Performance Measurement: Return on Investment; Residual Income; Economic Value Added and Return on Sales; Non – Financial Performance measures; Balanced Scorecard.

Suggested Readings:

1. Anthony A. Atkinson,, Robert S. Kaplan– Advanced Management Accounting – Prentice Hall of India, N. Delhi.
2. Charles T. Horngren, Gary L. Sundem and William O. Stratton – Introduction to Management Accounting – Pearson Education, Delhi.
3. Bhattacharyya, Debarshi – Management Accounting – Pearson.
4. Charles T. Horngren, George Foster and Srikant M. Daller – Cost Accounting : A Managerial Emphasis – Prentice Hall of India, New Delhi.
5. M.Y.Khan, P.K.Jain – Management Accounting – Tata McGraw Hill.

Important Instructions for the Course Coordinator and the Examiner:

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Course Objective: *This course is designed to introduce the students to the fundamentals of research methods and to equip them to follow scientific methods in solving business problems.*

Course Outcomes:

- CO1:** Students will be able to relate with the basic understanding of research methodology in the changing business scenario.
- CO2:** Students will be able to identify and classify the application of analytical techniques to face the tasks aimed at fulfilling the objective of business decision making.
- CO3:** Students will be able to apply and demonstrate an understanding of ethical dimensions of conducting research.
- CO4:** Students will be able to distinguish and examine the necessary experimental techniques that help in scientific decision making.
- CO5:** Students will be able to judge and support best alternatively relating to the practices learnt through research methods.
- CO6:** Students will be able to assemble and formulate advanced ways of taking decisions in a logical manner.

Course Contents:**UNIT-I**

Introduction to Business Research. Formulation of the research problem and development of research hypotheses. Characteristics of Good Research, Ethics in Business Research. Research Process: Problem definition, Research Process, Research Design (Exploratory Research, Descriptive research and Experimental Research)

UNIT-II

Data collection, measurement and scaling: Secondary data collection methods, qualitative methods of data collection, attitude measurement and scaling, and questionnaire designing. Sampling Design: Sampling concepts, sampling techniques, sample size determination and data processing

UNIT-III

Preliminary data analysis and interpretation: Univariate and Bivariate analysis of data, Testing of hypotheses, Analysis of variance techniques (one way and two way ANOVA), non-parametric tests (chi-square test, run test, one sample and two sample sign test, Mann-Whitney U test, Wilcoxon Signed Rank Test and Kruskal – Wallis Test).

UNIT- IV

Advance Data analysis techniques: Correlation and regression analysis, Factor Analysis, Discriminant analysis, Cluster analysis and multidimensional scaling. Report writing and presentation of results.

Suggested Readings:

1. Zikmund, W. G. *Business Research Methods*. Thomson.
2. Copper, D. R., Schindler P. S. & Sharma, J. K. *Business Research Methods*, McGraw Hill Education.
3. Burns, R. B. & Burns, R. A. *Business Research Methods and Statistics using SPSS*, SAGE Publications Ltd.
4. Bajpai, N. *Business Research Methods*, Pearson.
5. Chawla, D. & Sondhi N., *Research Methodology: Concepts and Cases*, Vikas Publishing House.
6. Panneerselvam, R. *Research Methodology*, Prentice Hall India.
7. Kothari, C.R. *Research Methodology & Technique*, New Age International Publishers.

Important Instructions for the Course Coordinator and the Examiner:

- The list of cases and specific references including recent articles will be announced in the class at the time of launching of the course by the Course Coordinator.
- The examiner is required to cover all course outcomes framed for a particular course in a balanced manner while setting nine questions in all. The first question will be compulsory consisting of six short questions covering the entire syllabus. In addition, eight more questions will be set comprising two questions from each unit. Wherever possible, the examiner may give a case study that will be equal to one question only. The students shall be required to attempt five questions in all selecting one question from each unit in addition to the compulsory Question No. 1. All questions shall carry equal marks. The maximum time allotted for the major test is 03 (three) hours.

FINAL YEAR COMPULSORY PAPERS

MC-301**CORPORATE GOVERNANCE AND BUSINESS ETHICS****Time Allowed: 3 Hours****M.M:60**

Course Objective: *The objective of this course is to sensitize the students about the various ethical and corporate governance issues in business management in the current environment.*

Course Outcomes:

CO1: The students will be able to list various constituents of entrepreneurship development.

CO2: The students will be able to identify the various environmental factors affecting entrepreneurship development

CO3: The students will be able to demonstrate skills to develop business plan at individual level.

CO4: The students will be able to examine the feasibility of a business.

CO5: The students will be able to evaluate the funding alternatives available for entrepreneurs.

CO6: The students will be able to develop and implement a business plan.

Course Contents:**UNIT-I**

Evolution of corporate governance; developments in India; regulatory framework of corporate governance in India; SEBI guidelines on corporate governance; reforms in the Companies Act.

UNIT-II

Corporate management vs. governance; internal constituents of the corporate governance; key managerial personnel (KMP); chairman- qualities of a chairman, powers, responsibilities and duties of a chairman; chief executive officer (CEO), role and responsibilities of the CEO.

UNIT-III

Introduction to Business Ethics: The concept, nature and growing significance of Ethics in Business, Ethical Principles in Business, Ethics in Management, Theories of Business Ethics, Ethical Issues in Business, Business Ethics in 21st Century.

UNIT-IV

Ethics in various functional areas of Business: Ethics in Finance, Ethics in HRM, Ethics in Marketing, Ethics in Production and Operation Management.

Suggested Readings:

1. Mallin, Christine A., *Corporate Governance (Indian Edition)*, Oxford University Press, Delhi.
2. Blowfield, Michael, and Alan Murray, *Corporate Responsibility*, Oxford University Press.
3. Francesco Perrini, Stefano, and Antonio Tencati, *Developing Corporate Social Responsibility-A European Perspective*, Edward Elgar.
4. Sharma, J.P., *Corporate Governance, Business Ethics & CSR*, Ane Books Pvt Ltd, New Delhi.
5. Manuel G. Velasquez, *Business Ethics*, Pearson Prentice Hall.
6. Ravindranath B. & Narayana B., *Business Ethics*, Vrinda Publications Pvt. Ltd

Important Instructions for the Course Coordinator and the Examiner:

- The list of cases and specific references including recent articles will be announced in the class at the time of launching of the course by the Course Coordinator.
- The examiner is required to cover all course outcomes framed for a particular course in a balanced manner while setting nine questions in all. The first question will be compulsory consisting of six short questions covering the entire syllabus. In addition, eight more questions will be set comprising two questions from each unit. Wherever possible, the examiner may give a case study that will be equal to one question only. The students shall be required to attempt five questions in all selecting one question from each unit in addition to the compulsory Question No. 1. All questions shall carry equal marks. The maximum time allotted for the major test is 03 (three) hours.

Course Objective: *The aim of the paper is to acquaint the students with the Business law and Company law in their future role as managers.*

Course Outcomes:

CO1: Students will be able to define laws applicable to a business.

CO2: Students will be able to classify different laws and explain their specific purpose.

CO3: Students will be able to illustrate cases of law and interpret own manner to solve the problems of business class

CO4: Students will be able to examine company laws and compare it with previous laws before amendment of 2013

CO5: Students will be able to evaluate the existing business laws in India and analyse their importance

CO6: Students will be able to formulate guidelines according to regulatory framework of an organisation

Course Contents:**UNIT-I**

The Indian Contract Act, 1872: Meaning of a Contract, Classification of Contracts, Essentials of a Valid Contract; Performance of a Contract; Discharge of a Contract; Breach of Contract; Quasi Contracts; Contract of Indemnity and Guarantee, Bailment and Pledge, Contract of Agency.

UNIT-II

The Sales of Goods Act, 1930: Meaning and essentials of a valid contract of sale, Distinction between sale and agreement to sell, Meaning of goods and their classification, Conditions and warranties, Doctrine of Caveat Emptor, Rights of an unpaid seller, Rights of buyer; Negotiable Instruments Act, 1881: Meaning and characteristics of negotiable instrument, Types of negotiable instruments and their characteristics, Holder and Holder-in-due-course, Discharge and Dishonour of negotiable instruments, Negotiation and Assignment.

UNIT-III

The Companies Act, 2013; Meaning and Characteristics of a Company; Objects and Applications of Companies Act, 2013; Landmark provisions of new Companies Act, 2013; Classification of companies, Concept of One Person Company; Formation of a company, Memorandum and Articles of association, Prospectus, Allotment of shares and share capital, Membership in companies.

UNIT-IV

Meetings of Companies: General principles of meetings, Types of meetings; Prevention of Oppression and Mismanagement; Winding up of a Company; Consumer Protection Act: Define consumer rights, provisions regarding complaints in consumer courts, Unfair Trade Practices and Restrictive Trade Practices, Consumer Protection Council, Consumer forum.

Suggested Readings:

1. Gulshan, S.S. and Kapoor, G.K., *Business Law including Company Law*, New Age International Publication.
2. Macintyre, E., *Business law*, Pearson Education.
3. Tulsian, *Business law*, Tata McGraw Hill.
4. Majumdar A.K. and Kapoor G.K., *Company Law and Practices*, Taxmann Publication.
5. Kothari, V., *Understanding Companies Act, 2013*, Taxmann Publication.
6. Pathak, A., *Contract Law in India*, Oxford University Press.
7. Gogna, P.P.S., *A Textbook of Company Law*, S. Chand Publishing.
8. Nolakha, R.L., *Company Law and Practice*, Vikas Publishing House Private Limited.

Important Instructions for the Course Coordinator and the Examiner:

- The list of cases and specific references including recent articles will be announced in the class at the time of launching of the course by the Course Coordinator.
- The examiner is required to cover all course outcomes framed for a particular course in a balanced manner while setting nine questions in all. The first question will be compulsory consisting of six short questions covering the entire syllabus. In addition, eight more questions will be set comprising two questions from each unit. Wherever possible, the examiner may give a case study that will be equal to one question only. The students shall be required to attempt five questions in all selecting one question from each unit in addition to the compulsory Question No. 1. All questions shall carry equal marks. The maximum time allotted for the major test is 03 (three) hours.

Course Objective: *The objective of the course is to enable students to get a thorough understanding of what conceptual knowledge they have acquired and how they will be able to express it unambiguously in a demanding situation*

Course Outcomes:

CO1: Student will be able to recall the important terms related to core and general courses of management.

CO2: Students will be able to explain their understanding about learnings from the programme.

CO3: Students will be able to demonstrate their soft and hard skills.

CO4: Students will be able to examine their own spontaneity, mannerisms and presence of mind which will help them in introspection for future such events (Job Interviews).

CO5: Students will be able to defend the knowledge about their respective field.

CO6: Students will be able to assemble their experiences gained during the programme.

Important Instructions for the Programme Coordinator and the Examiner:

- The Programme Coordinator will announce in the class in the beginning of the semester regarding the significance of the Comprehensive Viva-Voce Examination and the expectations of the Panel of Examiners from the passing out students of M.Com Programme.
- The Panel of Examiners duly constituted by the COE/Director/Principal will conduct an oral viva-voce examination to assess the overall programme objectives and overall course outcomes achieved by the students, during the programmes, on the basis of communication skills, course contents, analytical ability and question-answer handling skills of the student on a proforma duly notified to the students in advance.

Course Objective: *The objective of this course is to make students understand the scientific and systematic way of solving organizational problems by making valuable choices*

Course Outcomes:

CO1: Students will be able to draw a management or business problem in a scientific manner.

CO2: Students will be able to recognize the impediments and nuances associated with data requirements and find out the practical techniques of collecting data relevant for a research study.

CO3: Students will be able to apply the conceptual knowledge in a practical situation and learn how to conduct a study and present it in form of a report.

CO4: Student will be able to distinguish the appropriate data analysis techniques thus reporting the findings and suggestion associated with the problem at hand.

CO5: Students will be able to evaluate the procedure for the scientific and systematic research in solving pragmatic problems of any organization.

CO6: Student will be able to construct and formulate research problems objectively thus enabling themselves to make effective decisions.

Instructions for Research Project: The following instructions will be followed:

1. Research project, which is optional, should be from major or core area of specialization of the student and shall be in lieu of one paper of his/her major or core area of specialization.
2. Students opting for MC-402 Research Project in the 4th semester will have to register for the project in Semester III itself by submitting a synopsis along with consent of the supervisor in the Office of HSB and to the office of Director/ Principal in case of affiliated institutes by 15th November.
3. Research project will be accepted for submission and evaluation when at least one research paper out of the project work has been published or accepted in a research journal, or presented in any national conference/seminar. If a student fails to do so, then he/she has to give the presentation of the research project before a committee

constituted by Director, (HSB) in case of HSB and Director/ Principal in case of affiliated institutes.

4. The external examiner, appointed by the COE/Director, will evaluate the Research Project and will conduct viva-voce of 60 marks in the premises of HSB (for HSB students) and in the premises of affiliated institutes (for their respective students). However, the guide will submit the internal out of 40 marks separately.
5. The panel of examiners/experts will be provided by Director, HSB. The internal examiner for assisting the external examiner for evaluation and conducting viva voce will be appointed by the Director, HSB in case of HSB and Director/ Principal in case of affiliated institutes.

Course Objective: *The objective of this course is to make the already placed students to understand the procedural scientific and systematic way of solving organizational problems by making valuable choices.*

Course Outcomes:

- CO1:** Students will be able to outline the real issues faced by the organization.
- CO2:** Students will be able to convert their learning of research methods into a realistic research design for their topic of research.
- CO3:** Students will be able to apply the conceptual knowledge in a practical situation and learn how to conduct a study and present it in form of a report.
- CO4:** Students will be able to examine the impediments and nuances associated with data requirements and find out the practical techniques of collecting data relevant for a research study.
- CO5:** Student will learn to evaluate and select the appropriate data analysis techniques thus reporting the findings and suggestion associated with the problem at hand.
- CO6:** Students will be able to assemble and present the findings in a report.

Instructions for In-Company-Project-Work: The following instructions will be followed:

- If any student gets placement offer from any public or private sector organization during 4th semester and willing to join immediately, he or she may opt for In-Company-Project-Work-Report for which detailed guidelines will be notified separately, from time to time, after taking necessary approval of competent authority of the university.
- However, such In-Company-Project-Work-Report will be jointly supervised by the Academic Guide (to be nominated by the Director, HSB in case of HSB and Director/Principal in case of affiliated institutes) and Industry Guide (to be appointed by the competent authority of the concerned Organization, who has offered appointment to our student and any pressing hard to join immediately). The Academic Guide will get two hour per week credit per students maximum up to ten credits in his or her teaching workload.
- The evaluation process will be along with detailed guidelines in this connection.

OPEN ELECTIVES

Course Objective: *To develop basic skills among students to independently handle a wide range of employee counseling and performance counseling.*

Course Outcomes:

CO1: Students will be able to recall different terms used in counselling.

CO2: Students will be able to explain conceptual framework of counselling.

CO3: Students will be able to demonstrate the process of counselling.

CO4: Students will be able to differentiate between theories of counselling.

CO5: Students will be able to evaluate practical solutions to human behaviour related problems in the organization

CO6: Students will be able to develop his own model of counselling.

Course Contents:**UNIT-I**

Introduction to Counseling- Emergence, Growth, Definition, Need, Goal, Role and Characteristics of Counselor and Counselee, Difference between Counseling and Psychotherapy, and General Principles of Counseling

UNIT-II

Approaches to Counseling- Psycho-analytical (Sigmund Freud Theory), Therapeutic (Alfred Adler Theory), Behaviouristic (B. F. Skinner Theory), Cognitive (Albert Ellis Model) and Humanistic Approaches (Carl Rogers Approach);

UNIT-III

Counseling Process- 5-D Model, the Phases of Counseling Process, Counseling Environment and Procedure, and the Core Conditions of Counseling; Counselor's Attitude and Skills of Counseling- Verbal and Non-verbal Communication Modalities, Listening Skills, Listening Barriers and Strategies to Overcome Listening Barriers;

UNIT-IV

Organizational Applications of Counseling Skills- Identifying Problems and Coping Strategies with regard to Occupational Stress and Performance Management; Special Problems in Counseling- Selection of Counseling Strategies and Interventions, Changing Behavior through Counseling; Ethical and Legal Aspects of Counseling, and Current trends in Counseling.

Suggested Readings:

1. Cormer, L.S., and Hackney, H., *The Professional Counselor's Process Guide Helping*, Englewood Cliffs, Prentice Hall Inc.
2. Moursund, J., *The Process of Counseling and Therapy*, Englewood Cliffs, Prentice Hall Inc.
3. Munro, C A, *Counseling: A Skills Approach*, Methuen.
4. Reddy, Michael, *Counseling at Work*, British Psychological Society and Methuen.
5. Rao, S. Narayana, *Counselling and Guidance*, Tata McGraw Hill.
6. Gladding, S. T, *Counseling- A Comprehensive Profession*, Pearson.
7. Singh, Kavita, *Counselling Skills for Managers*, Prentice Hall of India.

Important Instructions for the Course Coordinator and the Examiner:

- The list of cases and specific references including recent articles will be announced in the class at the time of launching of the course by the Course Coordinator.
- The examiner is required to cover all course outcomes framed for a particular course in a balanced manner while setting nine questions in all. The first question will be compulsory consisting of six short questions covering the entire syllabus. In addition, eight more questions will be set comprising two questions from each unit. Wherever possible, the examiner may give a case study that will be equal to one question only. The students shall be required to attempt five questions in all selecting one question from each unit in addition to the compulsory Question No. 1. All questions shall carry equal marks. The maximum time allotted for the major test is 03 (three) hours.

Course Objective: *Econometrics is concerned with quantifying economic relations, with the provision of numerical estimates of the parameters involved and testing hypotheses embodied in economic relationships. This course aims to provide a basic introduction to econometric analysis, to enable students to examine existing theories with empirical data. In doing so, it examines the difficulties inherent in confronting theory with business data in order to quantify relationships, in dealing with errors and problems in variables which can be only observed but not controlled, and the means of compensating for uncertainty in data.*

Course Outcomes:

- CO1:** Students will be able to define and memorize the various fundamental terms and concepts of econometrics.
- CO2:** Students will be able to explain the basic assumptions, procedures and properties of various estimators.
- CO3:** Students will be able to apply various data analysis models.
- CO4:** Students will be able to compare the results obtained from various models.
- CO5:** Students will be able to evaluate the results and test their statistical significance.
- CO6:** Students will be able to develop a good quality research paper in finance and economics using the econometric methods

Course Contents:**UNIT-I**

Nature, scope and methodology of econometrics; Simple Linear Regression Model: Assumptions, Procedures and properties of OLS estimator, Co-efficient of determination, Tests of significance, Maximum Likelihood Method.

UNIT-II

Multiple Linear Regression Analysis: Method of least squares, Properties of OLS estimator, Test of significance of regression co-efficient, R^2 and adjusted R^2 ; Econometric Problems: Multi co linearity, Autocorrelation and Heteroscedasticity.

UNIT-III

Dummy variables-Nature and uses, Regression on dummy variables, Regression on Dummy Dependent Variable-The basic idea of the Linear Probability Model (LPM), Probit and Logit Models. Dynamic Econometric Models: Koyck distributed lag model, the adaptive expectation model, and the partial adjustment model.

UNIT-IV

Simultaneous Equation Models: Structural, Reduced and final forms, Identification-Order and rank conditions, Methods for estimating the simultaneous models-Basic idea of Indirect Least Square (ILS) and Two Stage Least Square (2SLS) methods. Seemingly Unrelated Regressions (SUR), SUR versus OLS

Suggested Readings:

1. Greene, William H., *Econometric Analysis*, Macmillan.
2. Johnston, J., *Econometric Methods*, McGraw -Hill.
3. Gujarati, Damodar N., *Basic Econometrics*, McGraw-Hill.
4. Stock J. H. and Watson M.W. *Introduction to Econometrics*, Addison-Wesley Series in Economics
5. Koutsoyiannis, A., *Theory of Econometrics*, Harper & Row.
6. Kmenta, J., *Theory of Econometrics*, Macmillan.
7. Maddala, G.S., *Introduction to Econometrics*, Macmillan.

Important Instructions for the Course Coordinator and the Examiner:

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- The examiner is required to cover all course outcomes framed for a particular course in a balanced manner while setting nine questions in all. The first question will be compulsory consisting of six short questions covering the entire syllabus. In addition, eight more questions will be set comprising two questions from each unit. Wherever possible, the examiner may give a case study that will be equal to one question only. The students shall be required to attempt five questions in all selecting one question from each unit in addition to the compulsory Question No. 1. All questions shall carry equal marks. The maximum time allotted for the major test is 03 (three) hours.

Course Objective: *The main objective of this course is to make students learn the various aspects of personal finance.*

Course Outcomes:

CO1: Students will be able to describe the different concepts of personal finance.

CO2: Students will be able to explain the risk profiling.

CO3: Students will be able to demonstrate the skills in selecting financial products.

CO4: Students will be able to examine the different financial products according to their risk profile.

CO5: Students will be able to evaluate the different financial products on the basis of their cost and benefits.

CO6: Students will be able to design the different financial products keeping in mind macro and micro variables.

Course Contents:**UNIT-I**

Personal Finance: Meaning and importance. Financial planning: meaning, process and role of financial planner. Risk profiling: client data analysis, life cycle, wealth cycle. Asset allocation: Strategic, Tactical, Fixed and Flexible.

UNIT-II

Risk Management: Meaning, process and importance. Distinguish between risk assessment, risk management and risk avoidance. Assessment of requirement of Health Insurance, Life Insurance and General Insurance. Choice of products for risk coverage

UNIT-III

Investment Management: meaning and importance. Investment avenues: equity, debt, gold, real estate, mutual funds, exchange traded funds. Portfolio management: meaning, construction, evaluation and revision. Loan management: meaning, types, importance and assessment, personal, car loan, home Loan etc.

UNIT-IV

Tax planning: basics terms of income tax, advance tax, tax deduction at source, deductions under section 80C, 80 CCC, 80 D and 80 G. Taxation of investment products. Retirement planning, Management of nomination, power of attorney and will

Suggested Readings:

1. Kapoor Jack R, *Personal Finance*, The McGraw-Hill companies.
2. Huang. Stanley S C and Randall, Maury R., *Investment Analysis and Management*. Allyn and Bacon.
3. Gaungully, Ashok, *Insurance Management*, New Age Publishers, New Delhi.
4. Ahuja, G K & Gupta Ravi, *Systematic Approach to Income Tax*, Allahabad, Bharat Law House.
5. Pandian, *Security Analysis and Portfolio Management*, Vikas Publishing House, New Delhi.

Important Instructions for the Course Coordinator and the Examiner:

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OE-304

APPLICATIONS OF MARKETING

Time Allowed: 3 Hours

M.M:60

Course Objective: *The main objective of this course is to acquaint the students with the various aspects of applications of the marketing principles in corporate world.*

Course Outcomes:

- CO1:** Students will be able to outline with the various application areas of marketing.
- CO2:** Students will be able to explain the key concepts related to the application areas of marketing.
- CO3:** Students will be able to use the marketing concepts in interpreting marketing strategies.
- CO4:** Students will be able to appraise a marketing environment from different perspective.
- CO5:** Students will be able to judge the overall marketing mix strategy of an organization.
- CO6:** Students will be able to develop a basic marketing strategy for varied areas of marketing.

Course Contents:

UNIT-I

Consumer Behavior: Introduction to consumer behavior, Understanding the role of internal and external influences on consumer behavior, Consumer Decision Making Process.

Sales and Distribution: Introduction to Sales, Its Importance, objectives and functions; Sales forecasting & designing sales territories; Distribution Channels: purpose & types of distribution channels

UNIT-II

Retailing: Introduction to Retailing; Organized Vs Unorganized retailing, Types of Retail formats.

Internet marketing: Relevance of Internet Marketing, Web analytics, SEO, Social Media Marketing.

UNIT-III

Marketing of Services: Introduction to Services, Characteristics of Services compared to Goods, Service Mix, Gap model of Service Quality, Service classification.

Marketing Communication: Elements of Marketing Communication, Relevance of IMC, Designing a Marketing Communication Programme

UNIT-IV

Industrial Marketing: Meaning and Concept of Industrial Marketing, Types of Industrial Customers, Classification of Industrial Products, Industrial Buying Process. Rural Marketing: Introduction to rural markets in India, Classification of products and services in rural marketing, Analysis of rural demand, Marketing Practices in rural market.

Suggested Readings:

1. Schiffman, L., & Wisenblit, J., *Consumer Behaviour*, Prentice Hall PTR.
2. Still, Richard R., Edward W. Cundiff, and Norman A.P. Govoni: *Sales Management*, Prentice Hall, New Delhi.
3. Christopher Lovelock, Jochen Wirtz and Jayanta Chatterjee, *Services Marketing*, Pearson Education
4. Bowersox and Others, *Physical Distribution Management*, Tata McGraw Hill, New Delhi.
5. Levy Micheal, Weitz Barton A. And Pandit Ajay, *Retailing Management*, Tata McGraw Hill, New Delhi
6. Havalder, Krishna K., *Industrial Marketing*, TMH, New Delhi.
7. George E. Belch, Michael A. Belch and Keyoor, Purani, *Advertising and Promotion*, McGraw Hill Education.
8. Charlesworth, A., *Internet Marketing: A Practical Approach*, BH Publications.
9. Acharya S. S. and Agarwal N. L., *Agricultural Marketing in India*, Oxford & IBH Publishing Co.

Important Instructions for the Course Coordinator and the Examiner:

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OE-305 EXPORT IMPORT PROCEDURES AND DOCUMENTATION

Time Allowed: 3 Hours

M.M:60

Course Objective: *The aim of the course is to acquaint the students with the export-import procedures and documentation*

Course Outcomes:

CO1: Students will be able to describe the legal framework and procedure governing international trade.

CO2: Students will be able to explain the incorporation of various terms in drafting of an export contract and understand the importance of risk management.

CO3: Students will be able to apply the concepts learned in terms of export order, delivery and international trade pricing to actual transactions.

CO4: Students will be able to appraise the role and importance of export-import documentation and procedure framework according to commodities and countries.

CO5: Students will be able to evaluate the nuances of import and export clearance procedures.

CO6 Students will be able to develop the skills to export-import various commodities in different countries and avail benefits of various export incentives and promotional schemes given by government.

Course Contents:

UNIT I

Export Preliminaries, Documentation in international trade: Aligned Documentation System (ADS); Commercial documents, Regulatory documents, Documents related to goods, shipment, payment, inspection and legal regulated documents, Official machinery for consultation.

UNIT II

Export contract: Distinction between domestic sales contract and export sales contract, Major laws for export contracts, Elements in export contracts, Dispute settlement, Role of ICC; INCOTERMS, Containerization.

UNIT III

Export order processing; shipping and custom clearance of export and import cargo; central excise clearance; Role of clearing and forwarding agents. Types of risks in international trade, Cargo Insurance and claim Procedures

UNIT IV

Methods of payment in international trade; documentary collection of export bills, UCPDC guideline, Instruments of payments, Pre-shipment and post-shipment finance, Negotiation of documents with banks, Main Provisions of FEMA; Procedure and documentation for availing export incentives.

Suggested Readings:

1. C. Rama Gopal, Export Import Procedures, Documentation and Logistics, New Age International Publishers, New Delhi.
2. M. D. Jitendra, *Export Procedures and Documentation*, Rajat Publications.
3. Pervin Wadia, *Export Markets and Foreign Trade Management*, Manishka Publications.
4. Paras Ram, *Export: What, Where and How*, Anupam, Publications.
5. Government of India, *Handbook of Import - Export Procedures*.
6. Nabhi's Exporters Manual and Documentation.
7. Nabhi's New Import-Export Policy Procedures

Important Instructions for the Course Coordinator and the Examiner:

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Course Objective: *The objective of this course is to sensitize the students about the various ethical and corporate governance issues in business management in the current environment.*

Course Outcomes:

CO1: Students will be able to describe the different concepts of corporate governance.

CO2: Students will be able to explain the ethical dimension of doing business.

CO3: Students will be able to demonstrate the skills in implementing governance related matters

CO4: Students will be able to examine the different issues pertaining to corporate social responsibility of business.

CO5: Students will be able to evaluate the regulatory aspects of corporate governance.

CO6: Students will be able to design practical ways of inculcating ethics in various functions and operations of business.

Course Contents:**UNIT-I**

Evolution of corporate governance; developments in India; regulatory framework of corporate governance in India; SEBI guidelines on corporate governance; reforms in the Companies Act

UNIT-II

Corporate management vs. governance; internal constituents of the corporate governance; key managerial personnel (KMP); chairman- qualities of a chairman, powers, responsibilities and duties of a chairman; chief executive officer (CEO), role and responsibilities of the CEO.

UNIT-III

Introduction to Business Ethics: The concept, nature and growing significance of Ethics in Business, Ethical Principles in Business, Ethics in Management, Theories of Business Ethics, Ethical Issues in Business, Business Ethics in 21st Century.

UNIT-IV

Ethics in various functional areas of Business: Ethics in Finance, Ethics in HRM, Ethics in Marketing, Ethics in Production and Operation Management.

Suggested Readings:

1. Mallin, Christine A., *Corporate Governance (Indian Edition)*, Oxford University Press, Delhi.
2. Blowfield, Michael, and Alan Murray, *Corporate Responsibility*, Oxford University Press.
3. Francesco Perrini, Stefano, and Antonio Tencati, *Developing Corporate Social Responsibility-A European Perspective*, Edward Elgar.
4. Sharma, J.P., *Corporate Governance, Business Ethics & CSR*, Ane Books Pvt Ltd, New Delhi.
5. Manuel G. Velasquez, *Business Ethics*, Pearson Prentice Hall.
6. Ravindranath B. & Narayana B., *Business Ethics*, Vrinda Publications Pvt. Ltd

Important Instructions for the Course Coordinator and the Examiner:

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- The examiner is required to cover all course outcomes framed for a particular course in a balanced manner while setting nine questions in all. The first question will be compulsory consisting of six short questions covering the entire syllabus. In addition, eight more questions will be set comprising two questions from each unit. Wherever possible, the examiner may give a case study that will be equal to one question only. The students shall be required to attempt five questions in all selecting one question from each unit in addition to the compulsory Question No. 1. All questions shall carry equal marks. The maximum time allotted for the major test is 03 (three) hours.

Course Objectives: *The course aims to help student appreciate the significance of Indian Ethos and Values along with its relevance and implications to managerial decision making.*

Course Outcomes:

CO1: Students will be able to recall the values related to Indian ethos.

CO2: Students will be able to identify how Indian ethos is associated with business organizations.

CO3: Students will be able to demonstrate the skills required to develop a holistic approach towards management of organizations

CO4: Students will be able to appraise the importance of Indian education system and philosophy behind it.

CO5: Students will be able to evaluate the human values thus generating a value-driven management.

CO6: Students will be able to develop ways to solve real-life problems related to human behaviour based on his understanding on Indian ethos and values.

Course Contents:**UNIT I**

Indian Ethos: Meaning of Bharat, relevance of Indian ethos, role of Indian ethos in managerial practices; Sources of Indian Ethos in Management: Vedas, Ramayana, Bible, Quran, Kautilya's Arthashastra, Ethics v/s Ethos; Indian Management v/s Western Management

UNIT II

Modern Approach towards Indian Ethos : Introduction, Indian Management Thoughts, Holistic Approach to Management; Sadhana –In Management context, The Tatwas in Indian Ethos; Management Thoughts and Practice: Harmony with Environment, Dharma, Swadharma and Detachment, Holistic approach to Personality, Managerial Purusharth Karma yoga & enlightened leadership

UNIT III

Learning and Education System in India: Learning concept, Gurukul System of Learning, The beginning of modern education system, Achievements of the Indian education system; Law of Karma, Law of creation, law of humility, law of growth, law of responsibility

UNIT IV

Human Values: Meaning, significance, Vedic literature and values, formation of values, Aristotle's view on value inculcation, Objectives of value-based system, Interrelation of Values and Skills, Values and the workplace, Value-based Human response management, Need of value-based holistic management, Value-driven management, Indian culture and wisdom, The ethical and spiritual values and Methods of heart and mind purification

Suggested Readings:

1. Agarwal, T. & Chandorkar, N., *Indian Ethos in Management*, Himalaya Publishing House
2. Nandgopal, R. & Sankar, R.N.A., *Indian Ethos & Values in Management*, Tata McGraw Hill Education
3. Ganjre, A.K., Pawar, P. & Laxman R., *Indian Ethos - Modern Management Mantra*, Himalaya Publishing House
4. Bansal, I., *Management Concept in ancient India psycho-philosophic thought and their significance in present day organization*, Jaipur, Narayan Publication
5. Sharma. S., *Management in New Age: Western Windows Eastern Doors Management*, New Age International

Important Instructions for the Course Coordinator and the Examiner:

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- The examiner is required to cover all course outcomes framed for a particular course in a balanced manner while setting nine questions in all. The first question will be compulsory consisting of six short questions covering the entire syllabus. In addition, eight more questions will be set comprising two questions from each unit. Wherever possible, the examiner may give a case study that will be equal to one question only. The students shall be required to attempt five questions in all selecting one question from each unit in addition to the compulsory Question No. 1. All questions shall carry equal marks. The maximum time allotted for the major test is 03 (three) hours.

**OE-308 COMPUTER APPLICATIONS IN BUSINESS
AND CYBER SECURITY**

Time Allowed: 3Hours

MM: 40

Course Objective: *The Objective of this course is to familiarize the student with basic concepts of information technology, its application in business and make them conscious of cyber security laws and practice.*

Course Outcomes:

CO1: Students will be able to relate with various software related to office application.

CO2: Students will be able to explain and identify electronic data transfer takes place and will be able to handle data base management systems.

CO3: Students will be able to use and operate telecommunication networks which are most commonly used in organizations.

CO4: Students will be able to question and test the various operations of the internet.

CO5: Students will be able to evaluate and examine the perspectives of cyber security hence bearing ethical responsibility.

CO6: Students will be able to develop solutions for real-life problems based on computer applications and cyber security.

Course Contents:

UNIT-I

Software Packages for Office Applications- Word Processing using MS Word, Spreadsheets using MS Excel, Presentations using MS PowerPoint, Creating web pages and web applications with HTML, Business functionalities using Tally software.

UNIT-II

Electronic Data Processing: An introduction; Data processing cycle; data hierarchy; data file structure; file organization, Data Base Management Systems

UNIT-III

Telecommunication and Networks: Types of Telecommunication Networks, Telecommunications Media, Network Topologies, Network Architectures-The OSI Model. The Internet, Intranet and

Extranets: Operation of the Internet, Services provided by Internet, World Wide Web, Intranet and Extranets.

UNIT-IV

Cyber Security: Perspective of Cyber security, Application security, Information security, Network security, End-user education, Cryptography / Encryption, Security issues in wireless, Security Threats and Vulnerabilities, Ethical Responsibility - Business Ethics, Technology Ethics; Cyber Crime and Privacy Issues. Brief introduction to Information Technology Act, 2000, IT (Amendment) Act

Suggested Readings:

1. Ram, B., *Computer Fundamentals*, New Age Publications.
2. Rajaraman, V., *Introduction to Information Technology*, PHI.
3. Shrivastava., *Fundamental of Computer & Information Systems*, Wiley Dreamtech.
4. Chwan-Hwa (John) Wu, J. David Irwin, *Introduction to Computer Networks and Cybersecurity*, CRC Press.
5. Aparna Viswanathan, *Cyber Law*, LexisNexis Butterworths

Important Instructions for the Course Coordinator and the Examiner:

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- The examiner is required to cover all course outcomes framed for a particular course in a balanced manner while setting nine questions in all. The first question will be compulsory consisting of four short questions covering the entire syllabus. In addition, eight more questions will be set comprising two questions from each unit. At least one question should be numerical in nature from any of the given four units. Wherever possible, the examiner may give a case study that will be equal to one question only. The students shall be required to attempt five questions in all selecting one question from each unit in addition to the compulsory Question No. 1. All questions shall carry 8 marks each. The maximum time allotted for the major test is 03 (three) hours.

Course Objective: *The basic purpose of this course is to understand the framework for evaluating capital expenditure proposals, their planning, finance, appraisal and management in the review of the projects undertaken.*

Course Outcomes:

CO1: Students will be able to explain the importance, scope and functions of Disaster Management.

CO2: Students will be able to illustrate the Life Cycle of any given disaster management project.

CO3: Students will be able to sketch estimation of Guidelines for Time, Costs and Resources required for Disaster Management by applying different methods.

CO4: Students will be able to examine the Scheduling Resources and Reducing Disaster Duration.

CO5: Students will be able to evaluate Role and Responsibilities of the Disaster Manager, Planning, Organizing, Controlling, Skills of the Disaster Manager.

CO6: Students will be able to formulate strategies for risk reduction in Disaster.

Course Contents:**UNIT-I**

Introduction to Disasters: Concepts, and definitions (Disaster, Hazard, Vulnerability, Resilience, Risks) Disasters: Classification, Causes, Impacts (including social, economic, political, environmental, health, psychosocial, etc.), Differential impacts- in terms of caste, class, gender, age, location, disability, Global trends in disasters, urban disasters, pandemics, complex emergencies, Climate change

UNIT-II

Approaches to Disaster Risk reduction: Disaster cycle its analysis, Phases, Culture of safety, prevention, mitigation and preparedness community based DRR, Structural- nonstructural measures, roles and responsibilities of- community, Panchayati Raj Institutions/Urban Local Bodies (PRIs/ULBs), states, Centre, and other stake-holders.

UNIT-III

Inter-relationship between Disasters and Development: Factors affecting Vulnerabilities, differential impacts, impact of Development projects such as dams, embankments, changes in Land-use etc. Climate Change Adaptation. Relevance of indigenous knowledge, appropriate technology and local resources

UNIT-IV

Disaster Risk Management in India Hazard and Vulnerability profile of India, Components of Disaster Relief: Water, Food, Sanitation, Shelter, Health, Waste Management Institutional arrangements (Mitigation, Response and Preparedness, DM Act and Policy, Other related policies, plans, programmes and legislation), Contemporary issues in Disaster Management including COVID-19.

Suggested Readings:

1. Alexander David, Introduction in 'Confronting Catastrophe', Oxford University Press
2. Andharia J. Vulnerability in Disaster Discourse, JTCDM, Tata Institute of Social Sciences Working Papers
3. Blaikie, P, Cannon T, Davis I, Wisner B. At Risk Natural Hazards, Peoples' Vulnerability and Disasters, Routledge.
4. Coppola P Damon, Introduction to International Disaster Management,
5. Carter, Nick Disaster Management: A Disaster Manager's Handbook. Asian Development Bank, Manila Philippines.
6. Cuny, F. Development and Disasters, Oxford University Press.
7. Document on World Summit on Sustainable Development.

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FINANCE AREA

THIRD SEMESTER

MCF-311 CONTEMPORARY ISSUES IN ACCOUNTING**Time Allowed: 3 Hours****M.M:60**

Course Objective: *The objective of this course is to analyze the major issues in accounting in coherent and critical manner.*

Course Outcomes:

CO1: Students will be able to describe the contemporary issues in accounting.

CO2: Students will be able to summarise the models of Inflation Accounting

CO3: Students will be able to interpret the international dimensions of accounting

CO4: Students will be able to compare new concepts of accounting

CO5: Students will be able to apprise and evaluate real-world cases in corporate social accounting and valuation.

CO6: Students will be able to formulate financial reports.

Course Contents:**UNIT-I**

Human Resource Accounting: Meaning and definition of HRA, Importance and objectives of HRA, Limitations of HRA, Need of HRA for managers, Models of HRA. Social Accounting: Meaning and Definition of Social Accounting, Theories of Social accounting, Need and importance of Social Accounting, Current position of Social Accounting in India, Role of corporate Social Accounting.

UNIT-II

Inflation Accounting: Meaning and definition of Inflation Accounting, Various models of Inflation Accounting, Methods of Inflation Accounting. Brand Accounting: Overview of Brand Accounting, Importance and role of Brand accounting in corporate, various issues and challenges associated with Brand Accounting.

UNIT-III

International Dimensions of accounting and control: Multinational enterprise, Inter- nationalization of capital markets, Internationalization of accounting profession. Operational and conceptual issue. Foreign currency translations, methods and practices.

UNIT-IV

New Dimension of Accounting: Meaning of GAAP, Introduction to IFRS, Overview of IFRS, Comparative position of IFRS and Indian GAAP, Government influences on financial reporting. Introduction to forensic accounting, environmental accounting.

Suggested Readings:

1. M. David Haddock, John Price, & Michael Farina, *College Accounting: A Contemporary Approach*, Tata McGraw Hill.
2. Steven M. Bragg, *Interpretation and Application of Generally Accepted Accounting Principles 2011*, John Wiley.
3. Ken Marshall, Steve Arnold, *IFRS Conversion: Issues, Implications, Insights*, John Wiley.
4. Clifton, R., *Brands and Branding*, John Wiley.
5. Teng, *Financial Accounting*, Asian Book Pvt. Limited

Important Instructions for the Course Coordinator and the Examiner:

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- The examiner is required to cover all course outcomes framed for a particular course in a balanced manner while setting nine questions in all. The first question will be compulsory consisting of six short questions covering the entire syllabus. In addition, eight more questions will be set comprising two questions from each unit. At least one question should be numerical in nature from any of the given four units. Wherever possible, the examiner may give a case study that will be equal to one question only. The students shall be required to attempt five questions in all selecting one question from each unit in addition to the compulsory Question No. 1. All questions shall carry equal marks. The maximum time allotted for the major test is 03 (three) hours.

Course Objective: *The course aims at providing an in-depth understanding of all aspects affecting and arising out of Corporate & Financial Restructuring and Valuation, stressing upon and dealing exhaustively with key concepts, legislative aspects and procedures.*

Course Outcomes:

CO1: Students will be able to define the concepts and terminologies of financial restructuring.

CO2: Students will be able to summarise the theories underlying corporate restructuring and business valuation.

CO3: Students will be able to interpret the regulatory environment governing financial restructuring and valuation.

CO4: Students will be able to compare different valuation models.

CO5: Students will be able to apprise and evaluate real-world cases in corporate restructuring and valuation.

CO6: Students will be able to formulate a plan to successfully liquidate or reorganize a business.

Course Contents:**UNIT 1**

Corporate Restructuring: Meaning, Need, Scope and Modes of Restructuring; Historical Background; Emerging Trends; Planning, Formulation and Execution of Various Corporate Restructuring Strategies - Mergers, Acquisitions, Takeovers, Disinvestments and Strategic Alliances, Demerger.

UNIT II

Financial Restructuring: concept & need for Financial Restructuring, Reduction of Capital; Reorganization of Share Capital; Buy-Back of Shares – Concept and Necessity; Procedure for Buy-Back of Shares by Listed and Unlisted Companies. Legal, Economic, Taxation and Financial aspects of Mergers and Amalgamation

UNIT III

Valuation: Meaning, Objective & Scope of Valuation; Principles of Valuation; Preliminary Work relating to Valuation; Valuation Standards and Valuation Analysis; Valuation Techniques; Historical Earnings Valuation; Asset Based Valuation; Market Based Valuation.

UNIT IV

Regulatory Aspects of Valuation: Legal & Regulatory aspects related to Valuation such as SEBI Regulations/ RBI Regulations; Income Tax Implications; Valuations for Different Strategies- Merger & Acquisition, Demerger, Slump Sale, Liquidation and Corporate Insolvency, Internal & External Restructuring, Valuation of Intangibles, Valuation of Securities

Suggested Readings:

1. Corporate Restructuring Valuation and Insolvency by The Institute of Company Secretaries of India
2. Ray, *Mergers and Acquisition Strategy, Valuation and Integration*, PHI
3. Ramaiya, A., *Guide to Companies Act*, LexisNexis Butterworths, Wadhwa, Nagpur
4. Sampath, K., R., *Mergers /Amalgamations, Takeovers, Joint Ventures, LLPs and Corporate Restructure*, Snow White Publications
5. *Handbook on Mergers Amalgamations and takeovers* by The Institute of Company Secretaries of India

Important Instructions for the Course Coordinator and the Examiner:

- The list of cases and specific references including recent articles will be announced in the class at the time of launching of the course by the Course Coordinator.
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Course Objective: *This course is designed to prepare the students to interpret and analyze the financial Statement for effective financial decisions.*

Course Outcomes:

CO1: Students will be able to define the terminologies related to financial statement analysis.

CO2: Students will be able to explain key elements of making financial statement.

CO3: Students will be able to apply techniques used in financial analysis.

CO4: Students will be able to appraise financing and investing activities of corporate houses.

CO5: Students will be able to evaluate credit problems using quantitative techniques.

CO6: Students will be able to formulate policies for Accounting and Financial Analysis.

Course Contents:**UNIT-I**

Overview of financial statement analysis: Types and components Business analysis, basis of analysis, financial statement analysis preview, relevance to business decisions and steps in analyzing financial statements; Financial reporting and analysis: Reporting environment, Form of the financial statements, IFRS framework for the preparation and presentation of financial statements.

UNIT-II

Accounting analysis: Analysis of financing activities; Analysis of investing activities; Analyzing investing activities and inter-corporate investments; Analysis of operating activities and income: understanding method of revenue and expenses.

UNIT-III

Financial analysis: Analysis of cash flow statements; Return on invested capital and profitability analysis; Prospective analysis: Projection process, projecting financial statements, application of prospective analysis in the residual income, valuation model and trends in value drivers; Short term liquidity analysis: working capital analysis, operating activity analysis.

UNIT-IV

Credit analysis: Liquidity and working capital, and capital structure and solvency; Equity analysis and valuation: Earning persistence, earning based equity valuation and earning power and forecasting for valuation; Building blocks of financial statement analysis

Suggested Readings:

1. Wild, John J, Subramanyam, K.R. and Halsey Robert E., *Financial Statement Analysis*, Ninth edition, McGraw-Hill, New Delhi.
2. Bernstein, Leopold A., *Financial Statement Analysis*, McGraw-Hill International.
3. Foster, George. *Financial Statement Analysis*, Prentice Hall.
4. Penman, Stephen H. *Financial Statement Analysis and Security Valuation*, McGraw-Hill International
5. Stickney, Clyde P. and Brown, Paul R. *Financial Reporting and Statement Analysis*, The Dryden Press.
6. Hampton, John. J., *Financial Decision Making*. Prentice Hall of India Pvt. Ltd., New Delhi.
7. Levy. H. and Sarnat H., *Capital Investment and Financial Decision*, Englewood Cliffs, Prentice Hall Inc.
8. Van Horne, James C. *Financial Management and Policy*. Englewood Cliffs, Prentice hall of India.

Important Instructions for the Course Coordinator and the Examiner:

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- The examiner is required to cover all course outcomes framed for a particular course in a balanced manner while setting nine questions in all. The first question will be compulsory consisting of six short questions covering the entire syllabus. In addition, eight more questions will be set comprising two questions from each unit. At least one question should be numerical in nature from any of the given four units. Wherever possible, the examiner may give a case study that will be equal to one question only. The students shall be required to attempt five questions in all selecting one question from each unit in addition to the compulsory Question No. 1. All questions shall carry equal marks. The maximum time allotted for the major test is 03 (three) hours.

Course Objective: *The objective of this course is to impart knowledge to students regarding the theory and practice of Security Analysis.*

Course Outcomes:

CO1: Students will be able to describe the environment and working of capital markets.

CO2: Students will be able to discuss and differentiate different financial assets and their holding motives

CO3: Students will be able to demonstrate the processes of calculating risk and return of financial assets

CO4: Students will be able to appraise the processes of doing fundamental and technical analysis

CO5: Students will be able to judge the trends in the stock markets.

CO6: Students will be able to develop a reasoned argument for security selection and investment choices

Course Contents:**UNIT-I**

The Investment Environment - Meaning and objective of investment, investment vs. gambling and speculation, investment alternatives, investment process, concept of return and risk.

UNIT-II

Security Analysis – Fundamental analysis: economic analysis, industry analysis and company analysis. Technical analysis: assumptions Dow theory, chart patterns, moving averages and market indicators. Efficient market theory: weak form hypothesis, semi-strong form hypothesis and strong form hypothesis.

UNIT-III

Fixed Income Securities - Bond fundamentals: bond characteristics, pricing and yields Valuation of fixed income and variable income securities

UNIT-IV

Indian Security Market - New issue market, secondary market: SEBI, NSE, BSE and market indices. Recent trends in Indian and international stock markets, exposure to leading business web portals like www.moneycontrol.com, www.bloomberg.com etc.

Suggested Readings:

1. Reilly, Frank K. And Brown, Keith C., *Investment Analysis and Portfolio Management*, South-Western Cengage Learning India Pvt. Ltd.
2. Bodie, Z., Kane, A. and Marcus, A., *Investments*, McGraw-Hill.
3. Fischer, Donald E. and Jordan, Ronald J., *Security Analysis and Portfolio Management*, Prentice Hall of India.
4. Sharpe, William F. et al, *Investment*. New Delhi, Prentice Hall of India.
5. Fuller, Russell J. and Farrell, James L., *Modern Investment and Security Analysis*, New York, McGraw Hill.
6. Alexander, Gordon J. and Bailey, Jeffery V., *Investment Analysis and Portfolio Management*, Dryden Press, Thomson Learning
7. Machiraju, H. R., *Indian Financial System*, Vikas Publishing House.

Important Instructions for the Course Coordinator and the Examiner:

- The list of cases and specific references including recent articles will be announced in the class at the time of launching of the course by the Course Coordinator.
- The examiner is required to cover all course outcomes framed for a particular course in a balanced manner while setting nine questions in all. The first question will be compulsory consisting of six short questions covering the entire syllabus. In addition, eight more questions will be set comprising two questions from each unit. Wherever possible, the examiner may give a case study that will be equal to one question only. The students shall be required to attempt five questions in all selecting one question from each unit in addition to the compulsory Question No. 1. All questions shall carry equal marks. The maximum time allotted for the major test is 03 (three) hours.

Course Objective: *To acquaint the students with the mechanism of the foreign exchange markets, measurement of the foreign exchange exposure, and hedging against exposure risk. Upon successful completion of this paper, Students should expect to learn the nature and purposes of foreign exchange management under the new financial order evolving higher degree of vulnerability in a highly borderless financial world.*

Course Outcomes:

- CO1:** Students will be able to state appropriate formats and technologies to financial communication.
- CO2:** Students will be able to identify market conventions on exchange rate quotation and correctly calculate those quotations.
- CO3:** Students will be able to apply information within the global financial environment of foreign exchange to solve problems and make informed decisions.
- CO4:** Students will be able to appraise forward exchange rates given spot exchanges rates and rationale behind it.
- CO5:** Students will be able to evaluate the problems of dealing in foreign currency and the advantages and disadvantages of overseas funding.
- CO6:** Students will be able to develop an integrative understanding of the foreign exchange market and the relationships between interest rates, spot and forward rates and expected inflation rates.

Course Contents:**UNIT-I**

Foreign Exchange Market: Function and Structure of the FOREX markets, Foreign exchange market participants, Types of transactions and Settlements Dates, Exchange rate quotations, Nominal, Real and Effective exchange rates, and Determination of Exchange rates in Spot markets. Exchange rates determinations in Forward markets. Exchange rate behavior-Cross Rates Arbitrage profit in foreign exchange markets, Swift Mechanism.

UNIT-II

International Parity Relationships & Forecasting Foreign Exchange rate:- Measuring exchange rate movements-Exchange rate equilibrium – Factors effecting foreign exchange rate- Forecasting foreign exchange rates .Interest Rate Parity, Purchasing Power Parity & International Fisher effects.

UNIT-III

Foreign Exchange exposure:-Management of Transaction exposure (**Case Study: Airbus Dollar Exposure**); Management of Translation exposure- Management of Economic exposure (**Case study: Exporter's/Importer's Position: Hedge or Hedge Not**).

UNIT-IV

Foreign exchange risk Management: Hedging against foreign exchange exposure – Forward Market- Futures Market- Options Market- Currency Swaps-Interest Rate Swap. Cross currency Swaps- Hedging through currency of invoicing- Hedging through mixed currency invoicing.

Suggested Readings:

1. Eun and Resnick, *International Financial Management*, Tata McGraw Hill.
2. Eiteman, Moffett and Stonehill, *Multinational Business Finance*, Pearson.
3. Jeff Madura, *International Corporate Finance*, Cengage Learning.
4. Alan C. Shapiro, *Multinational Financial Management*, Wiley India
5. Apte, P. G *International Financial Management*, TMH.
6. Maurice Levi *International Finance*, Routledge.
7. Paul Einzip, *A Textbook on Foreign Exchange*
8. Paul Roth, *Mastering Foreign Exchange and Money Markets*, Pitman.

Important Instructions for the Course Coordinator and the Examiner:

- The list of cases and specific references including recent articles will be announced in the class at the time of launching of the course by the Course Coordinator.
- The examiner is required to cover all course outcomes framed for a particular course in a balanced manner while setting nine questions in all. The first question will be compulsory consisting of six short questions covering the entire syllabus. In addition, eight more questions will be set comprising two questions from each unit. Wherever possible, the examiner may give a case study that will be equal to one question only. The students shall be required to attempt five questions in all selecting one question from each unit in addition to the compulsory Question No. 1. All questions shall carry equal marks. The maximum time allotted for the major test is 03 (three) hours.

Course Objective: *The objective of this course is to impart knowledge to students regarding the techniques of measurement and control of risk.*

Course Outcomes

CO1: Students will be able to define the basic concepts of Insurance and Risk management

CO2: Students will be able to understand and comprehend the regulatory environment of Insurance

CO3: Students will be able to apply the knowledge in making suitable decisions

CO4: Students will be able to appraise the role of Insurance in Risk Management.

CO5: Students will be able to evaluate different forms of insurance that are prevailing in practice

CO6: Students will be able to develop products for life, general and health insurance.

Course Contents:**UNIT-I**

Introduction to risk management: The Concept of Risk, Risk v/s Uncertainty, Classification of risk; Major Personal Risks and Commercial Risks; objectives of Risk Management, steps in the Risk Management Process; Techniques of managing Risk

UNIT-II

Insurance and Risk: meaning and characteristics of Insurance, Insurable risk characteristics, Adverse selection, Types of Insurance, Benefits and costs of Insurance to Society, Enterprise Risk Management, Insurance Market Dynamics, Financial Analysis in Risk management Decision Making

UNIT-III

The evolution and growth of Life Insurance, various types of insurance; Principles of insurance; Insurance Contracts, Insurance Company Operations, leading Insurance companies in India, Role of IRDA

UNIT-IV

Life Insurance: Types of Life Insurance, Life Insurance Contractual Provisions, Buying Life Insurance, The Liability Risk, Auto Insurance, Home Insurance, Health Insurance, Group and Pension Insurance Policies

Suggested Readings:

1. Emmett J. Vaughan, *Risk Management*, John Wiley & Sons, Inc.
2. Rejda, G.E. & McNamara, J.M., *Principle of Risk Management & Insurance*, Parson
3. A. Suryanarayana, *Risk Management Models: A Primer*, ICFAI Reader.
4. Marshall John F. & Bansal, V. K., *Financial Engineering*, PHI Learning.
5. Watsham Terry J., *Futures and Options in Risk Management*, Thomson Learning
6. Karam Pal, Bodla & Garg, M.C., *Insurance Management*, Deep & deep Publications, New Delhi

Important Instructions for the Course Coordinator and the Examiner:

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FOURTH SEMESTER

Course Objective: *The objective of this course is to analyze the major concepts, theories and principles of banking and financial institutions in logical and critical manner.*

Course Outcomes:

- CO1:** Students will be able to recall the evolution and current state of Indian Financial System and banking Industry
- CO2:** Students will be able to describe the working and management of Commercial Banks in India
- CO3:** Students will be able to interpret the significance of being most tightly regulated industries in the world
- CO4:** Students will be able to appraise the regulatory structure within which the banking system operates
- CO5:** Students will be able to critically analyze the pivotal role of banking in a financial system
- CO6:** Students will be able to construct and analyze different challenges faced by banks and financial institutions

Course Contents:**UNIT 1**

Indian Financial System: Introduction, Evolution and growth of banking system in India, Bank Market structure in India, Banking sector reforms (The Narsimham Committee and The Raghu Ram Rajan Committee), Recent Innovations and development in Indian Banking.

UNIT II

Management of Commercial Banks in India: Functions of Bank, Sources of Bank Funds, Credit Management-Cardinal principles of sound bank lending, Formulating loan policy, Factors influencing loan policy; Investment Management-Nature and significance of investment management in commercial banks, Fundamental principles of security investment by commercial bank.

UNIT III

Capital Adequacy in Indian Banks: Functions of capital funds in commercial banks, Capital adequacy –Basel III norms on capital adequacy in Indian commercial banks; Concept of ALM : Objectives, Functions, Process, Measurement and Management of Risks, Concept of NPAs.

UNIT IV

Management of Financial Institutions: Financial Institutions, their role in economic development, challenges and opportunities; NABARD, IFCI, SIDBI, NHB– Introduction and their operational policies; Role of RBI; Insurance Industry in India, Mutual Funds, Micro Finance Institutions (MFIs); Current issues and future challenges in Management of Banks and financial Institutions.

Suggested Readings:

1. Srivastava, R.M. & Nigam, D., *Management of Indian Financial Institutions*, Himalaya Publishing House.
2. Khan, M. Y. *Indian Financial System*, Tata McGraw Hill.
3. Suresh, P. & Paul, J., *Management of Banking and Financial Services*, Pearson
4. Singh, S.P.N., *Management of Banking and Financial Institutions*, Centrum Press
5. *Principles & Practices of Banking by Indian Institute of Banking and Finance*, Macmillan Publications

Important Instructions for the Course Coordinator and the Examiner:

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- The examiner is required to cover all course outcomes framed for a particular course in a balanced manner while setting nine questions in all. The first question will be compulsory consisting of six short questions covering the entire syllabus. In addition, eight more questions will be set comprising two questions from each unit. Wherever possible, the examiner may give a case study that will be equal to one question only. The students shall be required to attempt five questions in all selecting one question from each unit in addition to the compulsory Question No. 1. All questions shall carry equal marks. The maximum time allotted for the major test is 03 (three) hours.

Course Objective: *The main objective of this course is to help students to learn the various concepts of financial markets and services and their role in the overall financial system.*

Course Outcomes:

- CO1:** Students will be able to describe financial market operations.
- CO2:** Students will be able to explain the various concepts related to financial markets and services.
- CO3:** Students will be able to solve various investment related issues facing the investors.
- CO4:** Students will be able to examine how the overall financial system works and various aspects associated with it
- CO5:** Students will be able to evaluate the best sources feasible for fulfilling their financial requirements related to the business
- CO6:** Students will be able to formulate different financial plans for the organisations with the help of different services provided by the financial markets

Course Contents:**UNIT-I**

Financial markets- Structure and Participants; Capital market ; Money market; Primary and Secondary Market Operations; Listing of securities; functions of stock exchanges; Role of SEBI; Introduction to derivative and commodity markets.

UNIT-II

Financial Services: Meaning, Nature and Types; Factoring: Meaning, Characteristics and Types of Factoring arrangements, Factoring in India, Factoring vs. Forfeiting; Credit Rating: Meaning and Types, Benefits of Credit rating to investors and companies; Objectives and Functions of Credit Rating Agencies.

UNIT-III

Credit Cards: Concept and Significance; Types of credit Cards, Credit Card business in India. Book Building: Concept and Mechanism of Book Building; Significance and Benefits of Book Building; Bought Out Deals: Meaning and Nature; Mechanisms of Bought out Deals.

UNIT-IV

Securitisation: Concept, Mode, Mechanism and Beneficiaries of Securitisation, Securitisation in India; Venture Capital: Meaning and Modes of Financing; Role and Functions of Merchant Bankers. Leasing: Concept, Classification, Accounting, Legal and Tax Aspects of Leasing

Suggested Readings:

1. Clifford, G., *Financial Markets, Institutions and Financial Services*, PHI.
2. Khan, M. Y., *Management of Financial Services*, McGraw-Hill.
3. Gordan, E and K. Natrajan, *Emerging Scenario of Financial Services*. Himalaya Publishing House
4. Meidan, Arthur Brennet, M., *Option Pricing: Theory & Applications*, Lexington Books.
5. Kim, Suk and Kim, Seung, *Global Corporate Finance. Text and Cases*, Miami Florida, Kotb
6. Khan, M., Y., *Financial Institutions and Markets*, McGraw Hill
7. Bhole, L.M., *Financial Institutions and Markets*, McGraw Hill

Important Instructions for the Course Coordinator and the Examiner:

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Course Objective: *The objective of the course is to acquaint the participant with the implications of tax structure and corporate tax planning in operational as well as strategic terms.*

Course Outcomes:

- CO1:** Students will be able to outline the meaning and scope of tax policy and basic concepts of tax in India
- CO2:** Students will be able to explain constitutional provisions pertaining to taxes in India
- CO3:** Students will be able to illustrate the computation of tax liability
- CO4:** Students will be able to appraise the rationale, benefits and costs of various tax incentives offered by government
- CO5:** Students will be able to evaluate tax implications while taking business decisions
- CO6:** Students will be able to formulate tax planning for individuals or business houses

Course Contents:**UNIT-I**

Basic Concepts of Income Tax; Computation of Income under Different Heads of Income, Clubbing of income, Set off and Carry forward of Losses, Deductions and Exemptions.

UNIT-II

Meaning and Scope of Tax Planning, Difference between Tax planning Tax Evasion and Tax Avoidance, Residential status and Tax incidence of a Company; Computation of Corporate Tax Liability.

UNIT-III

Tax Planning with reference to Location of Undertaking, Tax Planning regarding Dividends Policy, Tax Planning relating to specific managerial decisions, Tax planning for employees

UNIT-IV

Major defects in the structure of indirect taxes prior to GST; rationale for GST; features of GST law in India, structure of GST (SGST, CGST, UTGST and IGST); rates of GST, models of GST, GST Council

Suggested Reading:

1. Singhanian, V., K. & Singhanian, Monica, *Students' Guide to Income Tax*, Taxmann
2. Singhanian, V., K. & Singhanian, Kapil, *Direct Taxes Law and practice*, Taxmann
3. Singhanian, V., K. & Singhanian, Monica, *Corporate tax Planning and Business Tax Procedures*, Taxmann
4. Narwal, K.,P., & Anushuya, *GST in India*, DBH Publishers and Distributors
5. Ahuja, G.& Gupta, R., *Simplified Approach to Corporate Tax Planning and Management*, Bharat Law House private limited
6. Srinivas, E. A., *Handbook of Corporate Tax Planning*, Tata McGraw Hill.
7. Iyengar, A. & C. Sampat, *Law of Income Tax*, Bharat House.

Important Instructions for the Course Coordinator and the Examiner:

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Course Objective: *The objective of this course is to impart knowledge to students regarding the theory and practice of portfolio management.*

Course Outcomes:

CO1: Students will be able to define the concepts and terminologies of portfolio management.

CO2: Students will be able to summarise the theories underlying portfolio management.

CO3: Students will be able to apply the concepts of portfolio management and solve relevant numerical problems.

CO4: Students will be able to examine and evaluate portfolio performance.

CO5: Students will be able to apprise and judge trends in international financial markets.

CO6: Students will be able to construct investment portfolio and defend their choices.

Course Contents:**UNIT-I**

Introduction to Portfolio Management: Meaning, need, and objective of portfolio management, the process of portfolio management, determination of risk & return of a portfolio, risk analysis tools

UNIT-II

Theories of portfolio selection and management- Markowitz portfolio theory: optimal portfolio, meaning and construction of efficient frontier, investors' utility; CAPM: capital asset pricing model, risk-free and risky lending and borrowing, market portfolio; capital market theory: CML, SML and Sharpe Single Index Model; Arbitrage Pricing Theory (APT).

UNIT-III

Bond portfolio management strategies –bond characteristics, fundamentals of bond valuation, bond & equity portfolio management strategies: passive portfolio strategies & active portfolio strategies.

UNIT-IV

Portfolio evaluation and revision – portfolio performance evaluation, risk adjusted performance measures; meaning, need and constraints of portfolio revision; formula plans: constant-dollar-value plan, constant ratio plan, variable ratio plan, process and intricacies of trading system in Indian stock market.

Suggested Readings:

1. Reilly, Frank K. And Brown, Keith C., *Investment Analysis and Portfolio Management*, South-Western Cengage Learning India Pvt. Ltd.
2. Fischer, Donald E. and Jordan, Ronald J., *Security Analysis and Portfolio Management*, Prentice Hall of India.
3. Sharpe, William F. et al, *Investment*. New Delhi, Prentice Hall of India.
4. Fuller, Russell J. and Farrell, James L., *Modern Investment and Security Analysis*, New York, McGraw Hill.
5. Alexander, Gordon J. and Bailey, Jeffery V., *Investment Analysis and Portfolio Management*, Dryden Press, Thomson Learning
6. Machiraju, H. R., *Indian Financial System*, Vikas Publishing House.

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MCF-415 FINANCIAL AND COMMODITY DERIVATIVES**Time Allowed: 3 Hours****M.M:60**

Course Objective: *The objective of this course is to give an in depth knowledge of the functioning of derivative securities market.*

Course Outcomes:

CO1: Students will be able to describe the concepts and terminologies of financial and commodity derivatives.

CO2: Students will be able to explain the models used for pricing/valuation of derivatives

CO3: Students will be able to interpret innovations in financial and commodity markets

CO4: Students will be able to appraise investment opportunities in derivative market.

CO5: Students will be able to evaluate derivative pricing and hedging practices.

CO6: Students will be able to formulate basic risk management and trading strategies using derivatives.

Course Contents:**UNIT-I**

Financial Derivatives –Meaning, types, uses and factors driving the growth of derivatives. Forward Contracts v/s Future Contracts. Types of Traders: Futures Markets and the use of Futures for Hedging.

UNIT-II

Future Payoffs: long futures and short futures. Pricing stock futures: with dividend and without dividend. Application of futures: Hedging, speculation and arbitrage. Currency Futures: Meaning, uses and contract details. Interest Rate Futures: Meaning, uses and contract details.

UNIT-III

Stock Options: meaning, types and uses. General factors affecting stock option price Black-Scholes Option Model and Binomial model. Option based investment strategies-bullish, bearish, straddle, strangle and butterfly, Swaps: meaning& uses, currency swap & interest rate swap.

UNIT-IV

Introduction to Commodity Derivatives: meaning, uses, Cereals, metals and energy products.
History and Contemporary issues of Indian derivative market

Suggested Readings:

1. Brennet, M., *Option Pricing: Theory & Applications*. Toronto, Lexington Books.
2. Cox, John C and Rubinstein, *Mark Options Markets*. Englewood Cliffs, Prentice Hall Inc.
3. Huang. Stanley S C and Randall, Maury R., *Investment Analysis and Management*, Allyn and Bacon.
4. Hull. John C. *Options, Futures and Other Derivative Securities*, PHI.
5. Sharpe. William F. et al., *Investment*, Prentice Hall of India.

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Course Objective: *The objective of this course is to analyze the major concepts, theories of public finance in logical and critical manner.*

Course Outcomes:

- CO1:** Students will be able to relate public expenditure and revenue concepts.
- CO2:** Students will be able to identify the issues involved in public debt management in India
- CO3:** Students will be able to demonstrate integrative understanding of auditing system in India
- CO4:** Students will be able to compare the possible burden, benefits and distribution of various types of taxes and their impact on general welfare
- CO5:** Students will be able to appraise and critically evaluate the issues in Government finances
- CO6:** Students will be able to develop analytical skills and judgement in major areas of public finance reforms

Course Contents:**UNIT-I**

Nature and Scope of Public Finance;. Principle of maximum social advantage Public revenue-General considerations: Division of tax burden and incidence of taxes, Classification and choice of taxes and effect of taxation. Indian taxation system and its key issues

UNIT-II

Public Debt and some issues in debt management; Public expenditure- General considerations and effect of public expenditure; Public budget- budget classification, Performance and Programme budgeting system(PPBS) and Zero base budgeting ; Balance budget and fiscal policy. Comments on recent central Government budget

UNIT-III

Introduction to Indian Public Financial System – Historical background, Financial Federalism under Constitution; Indian Federal finance- Recommendations of latest finance commission of India; Public debt in India-Central and states Government debt.

UNIT-IV

Government of India Finances: expenditure trends expenditure policy, control of public expenditure in India, Suggestions for reforming the budget, trends in receipts. Railway finances, public sector in India and its Financial Autonomy and Accountability of Public sector, states finances and local finances. Investment policy of public sector in India: Financial, economic and social appraisal. Financial control; Legislative and Executive Accounting and Auditing System in India, Role of Comptroller and Auditor General (CAG), Contemporary Issues in Government Finances.

Suggested Readings:

1. Musgrave, R.A., and P. B. Musgrave, *Public Finance in Theory and Practice*, Tata McGraw Hill.
2. Harvey S. Rosen, Ted Gayer, *Public Finance*, McGraw Hill
3. Tayagi, B.P., *Public Finance*, S. Chand & Co.
4. Lekhi, R.K., *Public Finance*, Kalyani Publishers.
5. Mithani, D.M., *Public Finance and International Trade*, Himalaya Publications.

Important Instructions for the Course Coordinator and the Examiner:

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MARKETING AREA

THIRD SEMESTER

Course Objective: *The aim of this paper is to explicate the cutting edge service concepts to the students through bridging the gaps between theory and real world by incorporating practical management applications.*

Course Outcomes:

- CO1:** Students will be able to relate service and technology.
- CO2:** Students will be able to classify services and recognize service challenges.
- CO3:** Students will be able to use marketing research as a tool to understand customers and to deploy employees for service delivery.
- CO4:** Students will be able to examine the reasons of service failure and implementing strategies to recover it.
- CO5:** Students will be able to evaluate delivery and performance of services.
- CO6:** Students will be able to construct service design and standards.

Course Contents:**UNIT I**

Introduction to Services: Service and Technology, Goods versus Services, Service Marketing Mix, Gap model of Services, important service industries-Hospitality and Tourism, Transportation, Telecom, Banking and Insurance, Education and Entertainment, Healthcare. Service classification and challenges in Service Business.

UNIT II

Focus on the Customer: Consumer behaviour in Services, Customer Expectation of Services, and Customer perception of services Elements in an effective services marketing research programme, Building customer relationship, Relationship development strategies, Reasons of Service failure, Service recovery and strategies.

UNIT III

Aligning Service design and standards: Challenges of Services Innovation and design, new service development process Service Blueprinting, Customer-defined service standards and its types, Physical evidence and types of servicescape, Strategic roles of servicescape

UNIT IV

Delivering and performing services: Employees role in service delivery, Customers role in-service delivery, Delivering services through intermediaries and electronic channels, Strategies for matching capacity and demand, Key service communication challenges, Approaches to pricing services, Financial and Economic impact of services.

Suggested Readings:

1. Zeithaml, V., Bitner, M.J., Gremler, D.D.&Pandit, A., *Service Marketing*. McGraw Hill.
2. Lovelock, C., Wirtz, J.&Chatterjee, J., *Services Marketing*. Pearson Education.
3. Srinivasan, *Service marketing: Indian Context*, PHI
4. Swartz, T., Iqobucci, D., *Handbook of Service Marketing and Management*, Sage Publication

Important Instructions for the Course Coordinator and the Examiner:

- The list of cases and specific references including recent articles will be announced in the class at the time of launching of the course by the Course Coordinator.
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Course Objective: *The basic objective of this course is to develop an understanding about the consumer decision making process and its applications in marketing function of firms.*

Course Outcomes:

CO1: Students will be able to define various terms associated with the field of consumer behaviour.

CO2: Students will be able to explain different components of consumer behaviour.

CO3: Students will be able to interpret the impact of consumer behaviour while framing marketing strategies.

CO4: Students will be able to distinguish the individual and group aspects of consumer behaviour for devising marketing strategy.

CO5: Students will be able to select the most suitable consumer behaviour for understanding consumer psyche.

CO6: Students will be able to design a comprehensive marketing strategy based on consumer behaviour.

Course Contents:**UNIT – I**

Consumer Behaviour- Introduction to consumer behaviour; Its Roots in Various Disciplines, Interrelationship between Consumer Behaviour and Marketing Strategy, Consumer Research; Process, Research Methods & Tools, Types and its Relevance.

UNIT – II

Consumer as an Individual -Consumer Needs and Motivation; Goals, Dynamics of Motivation, Measurement of Motives, Personality and Consumer Behaviour; Nature, Theories of Personality and Self Concept, Consumer Perception and Information Processing; Dynamics of Perception, Consumer Imagery, and Perceived Risk, Learning & Consumer Involvement; Meaning, Behavioural & Cognitive Learning Theories and application to marketing, Consumer Attitude; Meaning, Attitude Formation & Change, Relationship in Behaviour & Attitude Formation, and Structural Models.

UNIT – III

Group Dynamics and Consumer Behaviour - Reference Groups; Meaning, Types, Affects, Relevance and Applications, The Family; Functions, Decision Making and Family Life Cycle, Social Class; Meaning, Types of Status, Lifestyle Profiles and Mobility in Social Classes, Measurements, Influence of Culture; Characteristics, Measurements & Core Values of Culture, Sub Cultural Aspects on Consumer' Mind Set; Meaning, Types & Understanding of Multiple Sub cultural Membership Interaction & Influence.

UNIT – IV

Consumer Decision Making Process- Personal Influence and the Opinion Leadership; Meaning and Dynamics of Opinion Leadership Process, Measurement of Opinion Leadership, Diffusion of Innovations; Process of Diffusion & Adoption, Profile of Consumer Innovator, Consumer Decision Making; Meaning of Decision, Levels of Decision Making. Consumer Behaviour Models, Current trends and ethical issues in Consumer Behavioural Studies.

Suggested Readings:

1. Assael, H., *Consumer Behaviour and Marketing Action*, Asian Books Private Limited, New Delhi.
2. Engel, J. F., Kollat, D.T., Roger D. Blackwell, R.D. *'Consumer Behaviour'*, Holt McDougal.
3. Hawkins, D., Mothersbaugh D., *Consumer Behavior: Building Marketing Strategy*, McGraw-Hill Education.
4. Schiffman, L. and Kanuk, L., *Consumer Behavior*, Prentice Hall.
5. Schiffman, L., & Wisenblit, J., *Consumer Behaviour*, Prentice Hall PTR.
6. Loudon, *Consumer Behavior: Concepts and Applications*, Tata McGraw-Hill Education Private Limited, Noida, Uttar Pradesh, India.

Important Instructions for the Course Coordinator and the Examiner:

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MCM-323 INTEGRATED MARKETING COMMUNICATION STRATEGY

Time Allowed: 3 Hours

M.M:60

Course Objective: *The aim of this paper is to acquaint the students with the concepts, techniques and developing skills regarding application of effective advertising programmes.*

Course Outcomes:

- CO1:** Students will be able to define various terms associated with the field of integrated marketing communication.
- CO2:** Students will be able to explain the components of integrated marketing communication.
- CO3:** Students will be able to interpret the impact of business environmental factors on the marketing communication strategy.
- CO4:** Students will be able to distinguish the utility of various promotional tools.
- CO5:** Students will be able to evaluate the effectiveness of marketing communication strategy.
- CO6:** Students will be able to develop a marketing communication strategy.

Course Contents:

UNIT-I

The growth of advertising and promotion, the evolution of IMC and a contemporary perspective, Promotional Mix: a tool for IMC, Analysis of the communication process, Role of IMC in the marketing process, Developing Marketing Planning Programme, Role of Advertising and Promotion.

UNIT-II

Participants in the IMC process: The clients Role, Role of advertising agencies, Types of Ad agencies, Agency compensation, evaluating agencies; An Overview of Consumer Behavior: Consumer decision-making process, Environmental influences on consumer behavior, Alternate approaches to consumer behavior

UNIT-III

Analyzing the communication process: A basic model of Communication, cognitive response approach, elaboration likelihood model; Source message and channel factors; Objectives and budgeting for IMC programmes: Establishing objectives and budgeting for promotional programmes; DAGMAR: An approach to setting objectives, problems in setting objectives, Establishing and allocating the promotional budget; Developing the IMC programme: Creative Strategy: Planning & development, Implementation and evaluation.

UNIT-IV

Media planning and Strategy: Developing the media plan, Establishing media objectives, Developing and implementing media strategies, Evaluation and follow-up; Evaluation of media: television & Radio, Evaluation of Print Media: Support Media, Direct Marketing, Direct Selling, The internet and interactive media, sales promotion, public relation, publicity and corporate advertising. Measure the effectiveness of the promotional programme. International advertising and promotion, regulation of advertising and promotion, evaluating the social, ethical and economic Aspects of advertising and promotion

Suggested Readings:

1. Blakeman, R. *Integrated Marketing Communication: Creative Strategy from Idea to Implementation*, Rowman & Littlefield
2. Dutta, K., *Integrated Marketing Communication*, Oxford Higher Education
3. Belch, G. E., Belch, M. A. and Purani, K., *Advertising and Promotion*, McGraw Hill Education.
4. Batra, R., Myers, J. G. and Aaker, A.D. *Advertising Management*, Pearson Education
5. Percy, L. and Elliot, R., *Strategic Advertising Management*, Oxford publishing
6. Sissors, J.Z. and Baron, R.B. *Advertising Media Planning*, McGraw Hill.
7. Jethwaney, J. and Jain, S., *Advertising Management*, Oxford publishing

Important Instructions for the Course Coordinator and the Examiner:

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Course Objective: *To provide an understanding of the concepts, attitudes, techniques and approaches required for effective decision making in the areas of Sales and Distribution Management.*

Course Outcomes:

- CO1:** Students will be able to define the concepts of sales management and distribution.
- CO2:** Students will be able to explain the role, functions, and methods of selling and distribution process.
- CO3:** Students will be able to apply the concepts to solve practical sales and distribution problems.
- CO4:** Students will be able to compare different methods used for sales and distribution related decisions.
- CO5:** Students will be able to appraise their sales management skills.
- CO6:** Students will be able to develop the strategies that help in taking strategic decisions.

Course Contents:**UNIT-I**

Sales Management: Role of Sales Management in Marketing, Nature and Responsibilities of Sales Management, Modern Roles and Required Skills for Sales Managers. Theories of Selling. Sales Planning: Importance, approaches and process of sales planning; Sales forecasting; Sales budgeting. Sales Organization: Purpose, principles and process of setting up a sales organization; Sales organizational structures; Field sales organization; Determining size of sales force.

UNIT-II

Territory Management: Need, procedure for setting up sales territories; Time management; Routing. Sales Quotas: Purpose, types of quotas, administration of sales quotas. Managing the Sales-force: Recruitment, selection, training, compensation, motivating and leading the sales-force; Sales meetings and contests

UNIT-III

Control Process: Analysis of sales, costs and profitability; Management of sales expenses; Evaluating sales force performance; Ethical issues in sales management.

UNIT-IV

Distribution Channels: Role of Distribution Channels, Number of Channels, Factors Affecting Choice of Distribution Channel, Channel Behavior and Organization, Channel Design Decision; Channel Management Decisions; Distribution Intensity; Partnering Channel Relationship.

Suggested Readings:

1. Still, Cundiff, Govoni , *Sales Management: Decisions, Strategies & Case*,– Prentice Hall, India.
2. Anderson R, *Professional Sales Management*, Englewood Cliff, New Jersey, Prentice Hall, India.
3. Spiro, Rosann L., Gregory A. Rich, and William J. Stanton, *Management of a Sales Force*, McGraw-Hill Irwin, Boston.
4. Dalrymple, Douglas J., and William L., *Sales Management: Concepts and Cases*, New York, NY: John Wiley and Sons.
5. Panda, T. K., Sahadev , S., *Sales And Distribution Management*, Oxford Publishing, India
6. Hughes, G. David, Daryl McKee, Charles H. Singler, *Sales Management: A Career Path Approach*, Cincinnati, OH: South-Western College Publishing
7. Peppers, D. & Rogers, M., 'The short way to long-term relationships'. *Sales and Marketing Management*

Important Instructions for the Course Coordinator and the Examiner:

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Course Objective: *The objective of this course is to enable students understand the importance and dynamics of a firm's physical distribution functions and management of its supply chain.*

Course Outcomes:

- CO1:** Students will be able to recall the terms used in logistics.
- CO2:** Students will be able to describe the importance of logistics.
- CO3:** Students will be able to apply the concepts of logistics for marketing.
- CO4:** Students will be able to appraise the components related to logistics.
- CO5:** Students will be able to evaluate the dynamics of physical distribution functions.
- CO6:** Students will be able to create an efficient logistics system for an organization.

Course Contents:**UNIT-I**

Introduction to Logistics Management: Nature, Role, Scope and Evolution of Logistics Management, Operational Objectives of Logistics; Concept of Supply Chain Management; Marketing and its Interface with Logistics; Total Cost Analysis and Trade off; Concept of Customer Service: Components of Customer Service, Customer Service Cost, Customer Service Measurement; Major Components/Decisions of Logistics Management; Integrated Logistics System; Distribution related issues and Challenges for Logistics.

UNIT-II

Transportation Decisions: Role of Transportation in Logistics, Elements of Transportation Cost, Selection of Transportation Mode, Multi-Decision Areas of Transportation: Containerization, Transportation Network and Tariffs; Third Party Logistics; Inventory Management: Role of Inventory Management in Logistics, Elements of Inventory Costs, Decision Areas of Inventory Management, Techniques of Inventory Control, Economic Order Quantity Under Conditions of Certainty and Uncertainty.

UNIT-III

Modern Concept of Warehousing: Role and Types of Warehouses, Warehouse Functions, Planning Warehousing Operations, Site Selection, Warehouse Layout, Operational Mechanism and Automation in Warehousing; Information and Order Processing: Role of Information System

in Logistics Management; Order Processing: Nature and Concept, Functions of Order Processing; Elements of Ordering cost.

UNIT-IV

Packaging: Role of Packaging in Logistics, New Emerging Packaging Alternatives, Packaging operations, Factors affecting packaging decisions; Material Handling: Objectives of Material Handling, Material Handling considerations; Equipments for Material Handling, Factors affecting Material Handling decisions. Distribution Control and Performance Evaluation: Integration of Logistics with Distribution System, IT-enabled Distribution and Logistics Management, Distribution Control and Performance Measurement.

Suggested Readings:

1. Bowersox and Others: *Physical Distribution Management*, Tata McGraw Hill, New Delhi.
2. Stern, Louis W. Adel, I.E.L. – Ansary, Annee T. Coughlan: *Marketing Channels*, Prentice Hall, New Delhi.
3. Ballu, Ronald H, *Business Logistics Management*, Englewood Cliffs, New York, Prentice Hall Inc.
4. Martin, Christopher and Gordon Wills: *Marketing Logistics and Distribution Management*
5. Khanna, K.K. *Physical Distribution Management*, Himalaya Publishing House, New Delhi.
6. Lambert, D. et. al., *Strategic Logistics Management*, Tata McGraw Hill, New Delhi.
7. Chopra, S and Meindl, P, *Supply Chain Management- Strategy, Planning and Operation*, Pearson Education.
8. Simchi-Levi, D et al., *Designing and Managing the Supply Chain*, The McGraw Hill Companies
9. Sharma, S, *Supply Chain Management-Concepts, Practices and Implementation*, Oxford University Press.

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MCM-326 PRODUCT AND BRAND MANAGEMENT**Time Allowed: 3 Hours****M.M:60**

Course Objective: *The objective of this course is to impart in depth knowledge to the students regarding the theory and practices of brand management.*

Course Outcomes:

- CO1:** Students will be able to define basic branding concepts and outline major branding issues.
- CO2:** Students will be able to identify branding challenges and opportunities.
- CO3:** Students will be able to apply marketing programme to build brand equity.
- CO4:** Students will be able to examine and implement different branding programmes.
- CO5:** Students will be able to evaluate brand performance and evaluating brand extension opportunities.
- CO6:** Students will be able to design and implement different branding strategies.

Course Contents:**UNIT-I**

Branding terminology, basic branding concepts- brand awareness, brand personality, brand image, brand identity, brand loyalty, brand equity, major branding decisions: selecting a brand name, brand extension decision, family versus individual brand names, multiple branding, private versus national branding, importance of branding

UNIT II

Branding challenges and opportunities, concept of brand equity, sources and benefits of brand equity, customer based Brand equity, designing marketing programme to built brand equity, measurement of brand equity, Strategic brand management process, concept of Brand positioning and repositioning, Identifying and establishing brand positioning and values.

UNIT III

Planning and implementing brand marketing programmes, designing marketing programmes, measuring and interpreting brand performance, Legal aspects of Branding, Copyright, Trademarks and IPR, designing and implementing branding strategies; Brand building and communication, E-Branding, handling brand name changes.

UNIT IV

New products and brand extension, evaluating brand extension opportunities, reinforcing brands, revitalising brands, managing brands over geographic boundaries and market segments, rationale for going international, global marketing programmes- advantage and disadvantage, standardisation versus customisation, global brand strategy. Branding in rural marketing, branding in specific sectors: retail, industrial, service brands

Suggested Readings:

1. Kevin Lane Keller, *Strategic Brand Management*, Pearson Education.
2. David A Aaker, *Managing Brand Equity*, New York, Free Press.
3. Don Cowley, *Understanding brands*, Kogan page
4. J.N. Kapferer, *Strategic Brand Management*, Free Press.

Important Instructions for the Course Coordinator and the Examiner:

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FOURTH SEMESTER

Course Objective: *The objective of this course is to familiarize the students with the basic concepts of retailing and understanding retail business so as to make them ready for future roles as managers*

Course Outcomes:

- CO1:** Students will be able to define the different terms used in the retail sector.
- CO2:** Students will be able to identify the current retail structure in India.
- CO3:** Students will be able to demonstrate the insights of retailing and related key activities.
- CO4:** Students will be able to appraise the importance of retailing and its role in the success of modern businesses.
- CO5:** Students will be able to evaluate the current marketing scenario and identify retail opportunities thereof.
- CO6:** Students will be able to develop a retail plan for opening up a retail store.

Course Contents:**UNIT-I**

Introduction to Retail- Evolution of Retail, Organised Vs Unorganised retailing, Retail Mix, theories of retail development, Types of Retailers; Careers in Retailing; Understanding Consumers.

UNIT-II

Retail Locations- Planned and Unplanned, Retail Site Location- Site Characteristics, Trade Area Characteristics, Location and Site Evaluation; Store Layout and Design; Space Management; Visual Merchandising; Atmospherics

UNIT-III

Managing Merchandise - Merchandise Planning, Process, Forecasting Sales, Developing Assortment Plans, National Brands and Private Labels; Retail Pricing- Setting Retail Prices, Price Adjustments, Pricing Strategies; Retail Communication Mix.

UNIT-IV

Information and Supply Chain Management- Information Flows, Logistics, Distribution Centre. Contemporary issues in Retail-Significance of retail as an industry, Retail scenario at International and National Level, Technology in Retailing, Multi-channel Retailing, E-Retailing: Future of e-retailing, Challenges for traditional retail and e-retail, FDI in Retail.

Suggested Readings:

1. Pradhan, S., *Retailing Management Text and Cases*, Mc Graw Hill Education, New Delhi
2. Levy, Micheal, Weitz, Barton, A. and Pandit, Ajay, *Retailing Management*, Tata McGraw Hill, New Delhi
3. Berman, Barry and Evans, Joel, R., *Retail Management; A Strategic Approach*; PHI/Pearson Education; New Delhi
4. Newman, Andrew, J. & Cullen, Peter, *Retailing: Environment & Operations*, Vikas Publishing House; New Delhi.
5. Gilber, David, *Retail Marketing Management*, Pearson Education, New Delhi.

Important Instructions for the Course Coordinator and the Examiner:

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Course Objective: *The objective of this course is to analyze the major concepts of rural and agricultural marketing in coherent and critical manner.*

Course Outcomes:

- CO1:** Students will be able to recite problems in rural marketing and changing focus of corporate towards rural market.
- CO2:** Students will be able to recognize need of agricultural marketing in economic development and constraints of agricultural marketing.
- CO3:** Students will be able to solve the problems of cooperative sector in India.
- CO4:** Students will be able to appraise role of supply chain in agricultural marketing.
- CO5:** Students will be able to evaluate role of government and financial institution in growth of rural and agricultural marketing.
- CO6:** Students will be able to develop model for rural and agricultural marketing.

Course Contents:**UNIT-I**

Features, Significance, Scope and Limitations of rural markets in India; Environmental factors affecting rural markets; Changing focus of corporate towards rural markets; Demographic and psychographic profile of rural consumer; Classification of products and services in Rural marketing, rural demand and problems in rural marketing,

UNIT-II

Agriculture Marketing –Definition, Scope, Concept and Objectives; Differences in Agricultural and Consumer Marketing; Constraints in Agricultural marketing; Role of Agriculture in Economic Development of India; Role of Government in Agricultural Development; Agribusiness; Export potential for farm products -Supporting Services.

UNIT-III

Cooperative Marketing –Concept, History, Functions – Reasons for slow progress of cooperative sector, Advantages & Limitations of Organized retailing in Agri Inputs and Outputs, Trends in Agri Marketing. Supply Chain Management in Agri Business i.e. Cold Chains, Organized procurement & warehousing.

UNIT- IV

Marketing Mix for rural products; Role of financial institutions in rural marketing. Rural marketing strategies: Different models and case studies of corporate vis Tata Kisan Seva Kendra, Commodity market functioning etc. Innovative distribution Channels like ITC E-Choupal, Godrej Adhar, HUL Shakti.

Suggested Readings:

1. Acharya S. S. and Agarwal N. L., *Agricultural Marketing in India*, Oxford & IBH Publishing Co.
2. Dr. Subhash Bhave, *Agribusiness Management in India* –Text & Cases.
3. Arora, R C., *Integrated Rural Development*, Scharnd.
4. Desao. Vassal. *Rural Development*, Himalaya Publishing House
5. Mishar, S. N., *Politics and Society in Rural India*, Inter India.
6. Porter, Michael, E. *Competitive Strategy*, Free Press.
7. T.P Gopalaswamy, *Rural marketing- Environment, problems and strategies*

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Course Objective: *The objective of this course is to lay a foundation for an understanding of the complex dimensions of Industrial Marketing.*

Course Outcomes:

- CO1:** Students will be able to describe terms, concepts, and nature of industrial marketing.
- CO2:** Students will be able to compare industrial marketing with consumer marketing.
- CO3:** Students will be able to interpret the role of each stakeholder in industrial marketing value chain.
- CO4:** Students will be able to appraise competitor marketing strategy.
- CO5:** Students will be able to evaluate marketing mix strategy for industrial products.
- CO6:** Students will be able to develop an effective marketing strategy for industrial products.

Course Contents:**UNIT-I**

Industrial Marketing: concept, nature and scope of industrial marketing; Difference between industrial and consumer marketing; Economics of industrial demand; Understanding industrial markets and environment: Types of industrial customers, Classification of industrial products, Marketing implications for different customers and different product types, Purchase practices of industrial customers, Environmental analysis in industrial marketing.

UNIT-II

Organisational Buying and Buyer behavior: Buyer motives, Phases in industrial buying decision process, Types of buying situations, Interpersonal Dynamics of industrial buying behavior, Buyer-Seller relationship, Models of industrial buying behavior, Industrial Marketing Research process; Industrial market segmentation, target marketing and positioning.

UNIT-III

Product Strategy: Meaning and Concept of an industrial product, Determinants of product mix, Industrial Product Life Cycle and strategies, New product development process; Marketing strategies for product related services and pure services; Industrial pricing decisions: Factors influencing pricing decisions, Pricing strategies, Pricing methods.

UNIT-IV

Industrial distribution channels and marketing logistics: Distinctive nature of industrial distribution channels, Factors affecting the nature of industrial channels, Role of intermediaries, Types of industrial intermediaries, Channel design decisions, Role of logistics and customer services in industrial marketing, Major components/Major decision areas of logistics, Total cost approach; Industrial marketing communication: Role of personal selling and direct marketing in industrial marketing, Personal selling process, Importance of advertising, and sales promotion in industrial marketing, Sales force management, Strategic planning, Implementing and Controlling in industrial marketing.

Suggested Readings:

1. Reeder, Robert R. *Industrial Marketing: Analysis, Planning and Control*. Englewood Cliffs. New Jersey, Prentice Hall Inc.
2. Havalder, Krishna K., *Industrial Marketing*, TMH, New Delhi
3. Havalder, Krishna K: *Text and Cases*, TMH, New Delhi
4. Brennan, R, Canning, L & McDowell, R, *Business to Business Marketing*, Sage Publications Ltd.
5. Hill, Richard, *Industrial Marketing*, Homewood Illionis, Richard D. Irwin.
6. Webster, F E. *Industrial Marketing Strategy*, New York, John Wiley.
7. Ghosh, P.K, *Industrial Marketing*, Oxford University Press.
8. Mukerjee, *Industrial marketing*, Excel Books India

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Course Objective: *The objective of the course is to familiarize the students to design social campaigns with a view to bring change in the behavior of the public in the fields of public health and environment.*

Course Outcomes:

- CO1:** Students will be able to describe the meaning and nature of social marketing.
- CO2:** Students will be able to recognize the range of stakeholders involved in social marketing programmes and their role as target markets
- CO3:** Students will be able to interpret the marketing mix strategies in social marketing.
- CO4:** Students will be able to appraise social marketing problems and suggest ways of solving.
- CO5:** Students will be able to evaluate the social marketing plan.
- CO6:** Students will be able to develop a social marketing plan for achieving behavioral change.

Course Contents:**UNIT-I**

Social Marketing: Concept, Scope, Comparison with Commercial Marketing, Approaches to influence public Behavior; Social Marketing Planning Process; Elements of Campaign.

UNIT-II

Social Marketing Environment: Campaign Focus and purpose, Mapping the Internal and External Environments; Establishing Target Audiences: Target Marketing.

UNIT-III

Setting Campaign Objectives and Goals: Behavior Objective, Knowledge Objective, Belief Objective; Social Marketing Strategies: Product in social marketing, Price of a social marketing product.

UNIT-IV

Promotional Strategies: Types of Media Channels, Choosing Media Vehicles, Timings and Factors Influencing media strategies; Plan Evaluation and Monitoring: Outcome measures, Process Measures; Establishing Budgets and finding Funding Sources.

Suggested Readings:

1. Philip, Kotler, Ned Roberto, Nancy Lee, *Social Marketing: Improving the quality of life*, Sage Publication,
2. Nancy, R., Lee, Philip, Kotler, *Social Marketing; Influencing Behavior for Good*, Sage, R., Kraig, Lefebvre, *Social Marketing and Social Change*, Wiley.
3. Hong, Cheng, Philip Kotler, Nancy R. Lee, *Social Marketing for Public Health: Global Trend and Success Stories*, Jones and Bartlett Publishers, LLC

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Course Objective: *The aim of this paper is to acquaint the students with the concepts, techniques and developing skills regarding application of effective digital and social media marketing.*

Course Outcomes:

- CO1:** Students will be able to define various terms used in the field of digital and social media marketing.
- CO2:** Students will be able to explain the procedures used in planning and implementation of digital and social media marketing.
- CO3:** Students will be able to illustrate existing digital and social media marketing strategies.
- CO4:** Students will be able to distinguish the utility of various social media platforms for promoting a brand.
- CO5:** Students will be able to select the most suitable social media platform to market a brand.
- CO6:** Students will be able to design a social media marketing strategy for a brand.

Course Contents:**UNIT I**

Introduction to digital marketing, advantages of digital medium over other media, Impact of internet on consumer buying behaviour. Domain names; Website hosting; Lead generation; Ethical and Legal Issues in the field of digital marketing.

UNIT II

Search Engine Optimisation (SEO): Introduction to SEO; understanding search engines; basics of keyword research; On-page and off-page Search Engine Optimisation.

UNIT III

Search Engine Marketing (SEM): Introduction to SEM; Google Ad words; keywords; bidding and budget; quality score; creating and optimising campaign. Google Analytics; Content marketing; Affiliate marketing; Email marketing; Mobile marketing

UNIT IV

Social media marketing: meaning; approach to social media; types of social media websites; blogging; social media engagement; social media ROI; using social media for branding and promotion. Marketing on Facebook, LinkedIn, Youtube, Instagram, Pinterest

Suggested Readings:

1. Parkin Godfrey, *Digital Marketing: Strategies for Online Success*, New Holland Publishers.
2. Charlesworth A., *Internet Marketing: A Practical Approach*, BH Publications.
3. Chaffey Dave, *Internet Marketing: Strategy, Implementation and Practice*, Pearson Education.
4. Trengove Alex, Malczyk Anna and Beneke Justin, *Internet Marketing*, GetSmarter under the Creative Commons BY-NC 3.0.

Important Instructions for the Course Coordinator and the Examiner:

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Course Objective: *The aim of this course is to acquaint the students with concepts, techniques and give experience in the application of concepts for developing effective Customer Relationship programme.*

Course Outcomes:

- CO1:** Students will be able to describe the customer equity.
- CO2:** Students will be able to identify the benefits of value creation for retaining customers.
- CO3:** Students will be able to interpret the role of appropriate business process and technology management capabilities in managing customer relationship.
- CO4:** Students will be able to compare different processes.
- CO5:** Students will be able to evaluate CRM implementation Strategies.
- CO6:** Students will be able to design the strategies framework for the CRM integration in the existing function of the organisation.

Course Contents:**UNIT-I**

Prerequisites to CRM: Changing face of Indian market, Customer ownership and customer values, Customer life cycle (CLC) and Customer lifetime value (CLV), Customer relationship. Relationship Marketing- From traditional marketing approach to relationship marketing organizational pervasive approach, Service level agreements (SLA)

UNIT- II

Understanding CRM, Technology and CRM, Levels of CRM, Loyalty Management, Loyalty programmes, reasons of failure of loyalty programmes.
Service quality and service capacity planning: service capacity planning process; Customer driven quality and Quality Management System (QMS)

UNIT-III

Planning and implementation of CRM, CRM and Sales Force Automation (SFA): Objectives, Strategic advantage of SFA, Key factor for successful SFA. eCRM: Benefits, Data handling, eCRM

systems/applications in market, specifications of eCRM solutions, Scope and Significance of a CRM project, CRM implementation process.

UNIT-IV

Making CRM a success: Success factors for CRM, Business Process Reengineering (BPR) for CRM implementation, Data Quality Management (DQM).Securing Customer Data: Information security management system, Ethical issues in CRM, IT solutions of CRM and its Integration, Future of CRM.

Suggested Readings:

1. Makkar, U. & Makkar, H. K., *Customer Relationship Management*, McGraw Hill Education.
2. Dyche, Jill., *The CRM Handbook-A Business Guide to CRM*, Pearson Education Asia.
3. Anton, J., Petouhoff, N.L. & Kalia, S., *Customer Relationship Management*, Pearson.
4. Kumar, V. & Reinartz, W.,*Customer Relationship Management: Concept, Strategy, and Tools*, Springer, 2nd Ed.
5. Brown, A. Stanly, *Customer Relationship Management*, John Wiley.
6. Gosney, John W. and Thomas P. Boehm,*Customer Relationship Management Essentials*, Prentice Hall.
7. Seth, Jagdish N., *Customer Relationship Management*, Tata McGraw Hill Publishing Co.

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HUMAN RESOURCE MANAGEMENT AREA

THIRD SEMESTER

Course Objective: *The objective of this paper is to develop a conceptual as well as a practical understanding of the students regarding human resource planning in organizations*

Course Outcomes:

CO1: Students will be able to recall different terms used in Human Resource Planning.

CO2: Students will be able to explain conceptual framework of HRP.

CO3: Students will be able to demonstrate the process of HRP.

CO4: Students will be able to compare job related techniques.

CO5: Students will be able to evaluate practical solutions of problems related to manpower planning in the organization.

CO6: Students will be able to develop their own model of HR planning suitable to the organization.

Course Contents:**UNIT-I**

Human Resource Planning: Concept, Objectives, Benefits, Problems; Strategic Human Resource Planning; Job Analysis

UNIT-II

Human Resource Planning Process and Action Plans: Human Resource Demand Forecasting: Assessment and Techniques; Human Resource Supply Forecasting: Assessment and Techniques; Action plans for Recruitment and Selection, Separation, Retention, Training and Redeployment

UNIT-III

Productivity Management and Human Resource Planning: Work Study, Method Study, Work Measurement, Job Design, Work Scheduling.

UNIT-IV

Human Resource Planning in Changing Context: Human Resource Information System; Human Resource Accounting and Audit; Structure of Labor Force and Demographic Changes: Problems and Challenges.

Suggested Readings:

1. Sekhri, A., Human Resource Planning & Audit, Himalya Publishing House
2. Bhattacharyya D.K., *Human Resource Planning*, Excel Books India.
1. Dessler, G., *Human Resource Management*, Prentice Hall of India
2. Rao, V.S.P., *Human Resource Management*, Excel Books
3. Ashwathappa, K., *Text & Cases in Human Resources Management*, Tata McGraw Hill
4. D'Cenzo, David A. and Robbins, S. P., *Human Resource Management*, John Wiley
5. Gomez-Mejia, Luis R., D. B. Balkin, and. Cardy, R. *Managing Human Resources*, Prentice Hall
6. Rothwell, W. J., & Kazanas, H. C., *Planning and Managing Human Resources*, Jaico Publishing House
7. Stevenson, W., *Operations Management*, McGraw Hill

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Course Objective: *The course aims to provide an understanding, application and interpretation of the various labor laws and their implications for industrial relations and labor issues.*

Course Outcomes:

CO1: Students will be able to list the labor laws and related terminology.

CO2: Students will be able to explain the importance of various labor legislations.

CO3: Students will be able to apply the knowledge of labor laws in their working organizations.

CO4: Students will be able to appraise the implementation of various labor laws.

CO5: Students will be able to evaluate the practical implementation of various labor laws.

CO6: Students will be able to develop various case laws pertaining to labor issues for corporate sector.

Course Contents:**UNIT-I**

Introduction, Emergence, Need and Objectives of Labour Laws; Principles of Modern Labour Laws; Classification of Labour Laws; ILO, Indian Constitution and Labour Legislations.

UNIT-II

Regulative Labour Laws: Trade Union Act; Industrial Dispute Act; Factory Act.

UNIT-III

Wage-Related Labour Laws: Payment of Wages Act; Minimum Wages Act; Payment of Bonus Act; Payment of Gratuity Act.

UNIT-IV

Social Security Labour Laws: Workmen's Compensation Act; Employees' State Insurance Act; Employees Provident Fund and Miscellaneous Provisions Act.

Suggested Readings:

1. Singh, B.D., *Labour Laws for Managers*, Excel Books
2. Malik, P L., *Handbook of Industrial Law*, Eastern Books.
3. Kapoor, N.D., *Mercantile Law*, Sultan Chand and Sons.
4. Taxmann's Labour Laws, Taxmann Publishing Pvt. Ltd.
5. Srivastava, S. C., *Industrial Relations and Labour Law*, Vikas Publishing House.
6. Latest Bare Act of each Act.

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Course Objective: *Organizational efficiency and performance are intricately interlinked with industrial relations. This course attempts to appreciate the conceptual and practical aspects of industrial relations at the macro and micro levels.*

Course Outcomes:

CO1: Students will be able to describe the basic concepts of Industrial Relations.

CO2: Students will be able to explain the importance of organized trade unions.

CO3: Students will be able to apply the process of collective bargaining between managers and workers.

CO4: Students will be able to appraise the process of resolving industrial disputes in industrial organizations.

CO5: Students will be able to evaluate and compare the industrial relations scenario of different countries.

CO6: Students will be able construct cases of industrial disputes/ relations of corporate sector.

Course Contents:**UNIT-I**

Industrial Relations: Concept, evolution, significance, perspectives and organization; Anatomy of industrial relations; Industrial relations and the State; Trade Unions: Concept, significance, types, approaches and objectives, Problems of trade unions in India and recommendations of National Commission on labor for strengthening of trade unions.

UNIT-II

Collective Bargaining: concept, importance and process of bargaining; Participative Management: Forms of worker's participation in management; Tripartite and bipartite bodies; Standing order and Grievance procedure; Code of Discipline.

UNIT-III

Industrial Disputes: Conciliation and Board of conciliation; Arbitration: types and evaluation; Adjudication: Three tier System, Model principles for reference of dispute to adjudication.

UNIT-IV

Modern and international Scenario of Industrial relations: Industrial Relations and Technological Change; Industrial Relations and HRD; ILO and Industrial Relations; Legal Framework of Industrial Relations; Industrial Relations systems in India, UK, USA and Japan.

Suggested Readings:

1. Mamoria & Manoria, *Dynamics of Industrial Relations*; Himalaya Publishing House.
2. Niland, J R., *The Future of Industrial Relations*, Sage.
3. Davar; R.S., *Personnel Management and Industrial Relations*; Vikas Publishing House Pvt Ltd.
4. Manappa, A., *Industrial Relations*; Tata McGraw Hill Publishing Company Ltd.
5. Dwivedi; R.S., *Managing Human Resources and Industrial Relations*. Galgotia Publishing Company.
6. Srivatava; S.C., *Industrial Relations and Labour Laws*, Vikas Publishing House Pvt Ltd.
7. Venkata Ratnam, C.S., *Industrial Relations*; Oxford University Press.
8. Sen, R. *Industrial Relations in India*; Macmillan India Ltd.

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Course Objective: *The purpose of this course is to enhance the leadership skills of students and to develop insight into interpersonal dynamics through sensitivity training and experience based methods of learning.*

Course Outcomes:

CO1: Students will be able to recall different terms used in leadership dynamics.

CO2: Students will be able to explain conceptual framework of leadership dynamics.

CO3: Students will be able to apply various leadership theories in practical life.

CO4: Students will be able to compare the leadership styles practised by famous personalities.

CO5: Students will be able to evaluate various contemporary issues in leadership.

CO6: Students will be able to develop their own particular style of leadership.

Course Contents:**UNIT-I**

Leadership Dynamics: Concept, Leadership and Management, Leadership and Power, Successful Leadership versus Effective Leadership.

UNIT-II

Leadership Approaches: Trait Approach, Skills Approach, Behavioral Approach, Situational Approach, Contingency Approach, Path Goal Approach.

UNIT-III

Leadership Styles: Autocratic, Democratic, Participative, Supportive, Free- rein; Comparative Analysis of Leadership Styles, Building Effective Leadership Styles, Leadership Styles of Famous Personalities in general perspective and in managerial perspective.

UNIT-IV

Contemporary Issues in Leadership: Charismatic Leadership, Women Leadership, Multicultural Leadership, Team Leadership, Ethics in Leadership, Servant Leadership, Transactional and Transformational leadership.

Suggesting Readings:

1. Northouse, G. P., *Leadership: Theory and Practice*, Sage Publications.
2. Yukl, G., *Leadership in Organizations*, Pearson.
3. Hersey, P., Blanchard, K.H. and Johnson, D.E., *Management of Organisational Behaviour*, PHI.
4. Daft, L. R., *The Leadership Experience*, Cengage Learning.
5. Haldar, U. K., *Leadership and Team Building*, Oxford University Press.
6. Tripathi, D. K., *Team Building and Leadership*, Himalaya Publishing House.

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Course Objective: *The course is designed to promote understanding of issues related to the compensation or rewarding human resources in the corporate sector, public services and other forms of organizations and to impart skills in designing, analyzing and restructuring reward management systems, policies and strategies.*

Course Outcomes:

- CO1:** Students will be able to recall different terms used for compensation management.
- CO2:** Students will be able to explain various compensation management techniques.
- CO3:** Students will be able to demonstrate the process of fixing compensation for various employees of organisations.
- CO4:** Students will be able to compare compensation practices of various companies.
- CO5:** Students will be able to evaluate compensation practices of multinational companies.
- CO6:** Students will be able to develop compensation plans for managers of middle scale organisations.

Course Contents:**UNIT-I**

Compensation Management- Concept, objectives, nature, types, compensation responsibilities, compensation philosophies & approaches.

UNIT-II

Bases for pay- traditional bases, incentive pay and person-focused pay; Pay for Performance, Competency Based Pay, Team rewards; Designing Compensation System- internal alignment (job analysis and job evaluation), external competitiveness and individual contribution.

UNIT-III

Employee Benefits- legally required benefits, discretionary benefits and key issues in employee benefits; Compensating Executives, Laws relating to Compensation.

UNIT-IV

Contemporary Strategic Compensation Challenges- compensation practices of multinational corporations and working of different institutions related to reward system like wage boards, pay commissions.

Suggested Readings:

1. Martocchio, Joseph J, *Strategic Compensation: A Human Resource Management Approach*, Pearson Education.
2. Milkovich and Newman, *Compensation*, Tata McGraw-Hill.
3. Armstrong, Michel and Murlis, Helen, *Reward Management: A Handbook of Salary Administration*, Kogan Page.
4. Bhattacharya, M.S.& Sengupta, N., *Compensation Management*, Excel Books

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Course Objective: *To develop a set of conceptual frameworks that will help students to better analyze negotiations in general and master the business negotiation skills.*

Course Outcomes:

- CO1:** Students will be able to describe the fundamentals of business negotiation.
CO2: Students will be able to explain the power of business negotiation in resolving differences across personalities, gender and culture.
CO3: Students will be able to apply the process of business negotiation in resolving organisational conflicts.
CO4: Students will be able to compare negotiation strategies in resolving organisational conflicts.
CO5: Students will be able to appraise the negotiation strategies for resolving differences at individual and organisational levels.
CO6: Students will be able to develop innovative negotiation strategies for resolving conflicts.

Course Contents:**UNIT-I**

Negotiation Fundamentals: the Nature of Negotiations and conflicts; Distributive and Integrative Negotiation; Negotiation Strategy and Planning: Unilateral vs. Bilateral Strategies, Planning Process, Negotiation Sub Processes: Perception, Cognition, Emotions, and Communication.

UNIT-II

Negotiation Power: Influence Process, Negotiation Contexts: Relationships in Negotiation; Forms of relationships; Key elements in managing relationships, Agents, Constituents and Audiences: Coalitions, Standards for coalition decision making, Multiple Parties and Teams

UNIT-III

Individual Differences I: Personality and Negotiations, Individual Differences II: Gender and Negotiations, Negotiation across Cultures: International and Cross Cultural Negotiations, Culture and negotiation, Managerial and research perspective on cross cultural negotiation.

UNIT-IV

Resolving Differences: Managing Negotiation Impasses; Nature of impasses, resolving impasses; Negotiation Mismatches: Managing the shadow negotiation and social contract, Ury's Breakthrough Approach; Managing difficult negotiation: Third Party Approaches; Ethics in Negotiation.

Suggested Readings:

1. Lewicki Roy J. ,Saunders David M. & Barry Bruce,*Negotiations*, Tata McGraw Hill.
2. Brett,J.M., *Negotiating Globally*, Francisco, Josseys-Bass.

Important Instructions for the Course Coordinator and the Examiner:

- The list of cases and specific references including recent articles will be announced in the class at the time of launching of the course by the Course Coordinator.
- The examiner is required to cover all course outcomes framed for a particular course in a balanced manner while setting nine questions in all. The first question will be compulsory consisting of six short questions covering the entire syllabus. In addition, eight more questions will be set comprising two questions from each unit. Wherever possible, the examiner may give a case study that will be equal to one question only. The students shall be required to attempt five questions in all selecting one question from each unit in addition to the compulsory Question No. 1. All questions shall carry equal marks. The maximum time allotted for the major test is 03 (three) hours.

FOURTH SEMESTER

Course Objective: *The objective of this course is to acquaint the students regarding the concept, importance, process and implementation of performance management system in an organizations.*

Course Outcomes:

CO1: Students will be able to recall different terms used in performance management.

CO2: Students will be able to identify various performance management practices.

CO3: Students will be able to interpret various performance management techniques.

CO4: Students will be able to compare performance management practices of different companies.

CO5: Students will be able to evaluate the implementation of various performance management practices.

CO6: Students will be able to develop a performance management model for corporate sector.

Course Contents:**UNIT-I**

Foundations of Performance Management: Concept, Objectives, Significance of Performance Management, Performance Management Process, Performance Management and Strategic Planning, Performance Management and Performance Appraisal.

UNIT-II

Implementation of Performance Management System: Defining Performance and Choosing Measuring Approach, Models for assessing performance: balanced Scorecard, EFQM Model; Outcome Metrics: Economic Value added (EVA) & other economic measures; Measuring Results and Behavior, Common Problems in Employee Assessment, Gathering Performance Information, Implementing a Performance Management System.

UNIT-III

Performance Management and Employee Development: Personal Developmental Plans, 360 Degree Feedback Systems, Performance Management Skills, Contribution of Human Resource Management Practices to Employee Performance.

UNIT-IV

Reward Systems and Legal Issues: Traditional and Pay for Performance plans; Impact of leadership on organizational performance, Managing team performance, ethics in performance Management; Performance management practices in Indian organizations.

Suggested Readings:

1. Aguinis, H., *Performance Management*, Prentice Hall
2. Bagchi, S. N., *Performance Management*, Cengage Learning
3. Bhattacharyya, D, *Performance Management System & Strategies*, Pearson Education
4. Bacal, R., *Performance Management*, McGrawHill
5. Dessler, G., *Human Resource Management*, Pearson Education
6. Armstrong, M., *Performance Management – Key strategies and Practical Guidelines*, Kogan Page

Important Instructions for the Course Coordinator and the Examiner:

- The list of cases and specific references including recent articles will be announced in the class at the time of launching of the course by the Course Coordinator.
- The examiner is required to cover all course outcomes framed for a particular course in a balanced manner while setting nine questions in all. The first question will be compulsory consisting of six short questions covering the entire syllabus. In addition, eight more questions will be set comprising two questions from each unit. Wherever possible, the examiner may give a case study that will be equal to one question only. The students shall be required to attempt five questions in all selecting one question from each unit in addition to the compulsory Question No. 1. All questions shall carry equal marks. The maximum time allotted for the major test is 03 (three) hours.

MCH-432 LABOUR WELFARE AND SOCIAL SECURITY**Time Allowed: 3 Hours****M.M:60**

Course Objective: *The objective of this course is to acquaint the students with the significance and processes of Labor Welfare activities and Social Security measure adopted by the organizations.*

Course Outcomes:

CO1: Students will be able to recall different terms used in labour welfare and social security.

CO2: Students will be able to describe the labour inspection system in factories.

CO3: Students will be able to illustrate various social welfare facilities.

CO4: Students will be able to compare various welfare facilities provided by employers in factories.

CO5: Students will be able to evaluate the various social security measures provided to employees in factories.

CO6: Students will be able to develop labour welfare and social security measures for the employees of middle scale organisations.

Course Contents:**UNIT-I**

Labor Welfare Activities: Concept and Significance, Origin of Labor Welfare activities, Theories of Labor Welfare; Statutory Welfare Provision in Factory Act; Labor Welfare Funds; Labor Inspection System.

UNIT-II

Critical Estimate of Welfare Work by Employers, Local Bodies and Trade Unions; Welfare of Unorganized Labor; ILO and Labor Welfare

UNIT-III

Some Special Welfare Activities: Grain Shop Facilities, Educational Facilities, Medical and Reorientation, Workers education scheme; Industrial safety; Industrial housing; Industrial health; Industrial hygiene.

UNIT-IV

Social Security: Concept and Importance; Employees' Compensation in India; Sickness Insurance in India; Unemployment Insurance in India; Old Age and Invalidity Security; Social Security Measures in the selected Countries (England, Japan & U.S.A.).

Suggested Readings:

1. Dale Yoder, *Personal Management and Industrial Relations*, Tata McGraw Hill.
2. Monappa, Arun, *Industrial Relations*, Tata McGraw Hill.
3. Sharma, A.M., *Aspects of Labour Welfare and Social Security*, Himalaya Publishing House
4. Sivarethnamohan, R., *Industrial Relation and Labour Welfare*, PHI Learning Private Ltd.

Important Instructions for the Course Coordinator and the Examiner:

- The list of cases and specific references including recent articles will be announced in the class at the time of launching of the course by the Course Coordinator.
- The examiner is required to cover all course outcomes framed for a particular course in a balanced manner while setting nine questions in all. The first question will be compulsory consisting of six short questions covering the entire syllabus. In addition, eight more questions will be set comprising two questions from each unit. Wherever possible, the examiner may give a case study that will be equal to one question only. The students shall be required to attempt five questions in all selecting one question from each unit in addition to the compulsory Question No. 1. All questions shall carry equal marks. The maximum time allotted for the major test is 03 (three) hours.

MCH-433 MANAGING INTERPERSONAL AND GROUP PROCESSES**Time Allowed: 3 Hours****M.M:60**

Course Objective: *The purpose of this course is to advance understanding regarding interpersonal and group processes and help the students to examine and develop process facilitation skills mainly through laboratory and other experience based methods of learning.*

Course Outcomes:

CO1: Students will be able to define different concepts of Interpersonal and group processes.

CO2: Students will be able to explain interpersonal behaviour.

CO3: Students will be able to demonstrate the role of transactional analyses in interpersonal behaviour.

CO4: Students will be able to compare various group decision making techniques.

CO5: Students will be able to evaluate the role of negotiations in group conflicts.

CO6: Students will be able to construct their own interpersonal behaviour model.

Course Contents:**UNIT-I**

Group dynamics: types of groups, group properties, roles, norms, status and size, stages of group development and change; Group cohesiveness: factors contributing to group cohesiveness, Influence processes- power and politics in groups.

UNIT-II

Interpersonal communication: Uncertainty reduction theory, Social exchange theory, Cognitive dissonance theory; Interpersonal awareness and feedback process- Transactional Analysis; Interpersonal trust; Competition and cooperation.

UNIT-III

Group decision making: The Vroom Yetton Model, Techniques of group decision making, Advantages and disadvantages of group decision making; Group synergy; Team building.

UNIT-IV

Inter-group relation and conflict: nature and types of conflicts, causes of conflicts and remedial measures of group conflicts, Role of Negotiation in group conflicts; distributive and integrative negotiation, third party negotiation; Fundamental interpersonal relations orientation (FIRO-B).

Suggested Readings:

1. Chandan, J S, Organizational Behaviour, Vikas Publication.
2. Kolb, D., *Organizational Behaviour: Practical Readings for Management*, Englewood Cliffs, Prentice Hall Inc.
3. Mainiero, L A & Tromley C L., *Developing Managerial Skills in OB*, Prentice Hall of India,
4. Moore, M D., *Inside Organizations: Understanding the Human Dimensions*, Sage.

Important Instructions for the Course Coordinator and the Examiner:

- The list of cases and specific references including recent articles will be announced in the class at the time of launching of the course by the Course Coordinator.
- The examiner is required to cover all course outcomes framed for a particular course in a balanced manner while setting nine questions in all. The first question will be compulsory consisting of six short questions covering the entire syllabus. In addition, eight more questions will be set comprising two questions from each unit. Wherever possible, the examiner may give a case study that will be equal to one question only. The students shall be required to attempt five questions in all selecting one question from each unit in addition to the compulsory Question No. 1. All questions shall carry equal marks. The maximum time allotted for the major test is 03 (three) hours.

Course Objective: *To develop basic skills among students to independently handle a wide range of employee counseling and performance counseling.*

Course Outcomes:

CO1: Students will be able to recall different terms used in counselling.

CO2: Students will be able to explain conceptual framework of counselling.

CO3: Students will be able to demonstrate the process of counselling.

CO4: Students will be able to differentiate between theories of counselling.

CO5: Students will be able to evaluate practical solutions to human behaviour related problems in the organization.

CO6: Students will be able to develop their own model of counselling.

Course Contents:**UNIT-I**

Introduction to Counseling- Emergence, Growth, Definition, Need, Goal, Role and Characteristics of Counselor and Counselee, Difference between Counseling and Psychotherapy, and General Principles of Counseling

UNIT-II

Approaches to Counseling- Psycho-analytical (Sigmund Freud Theory), Therapeutic (Alfred Adler Theory), Behaviouristic (B. F. Skinner Theory), Cognitive (Albert Ellis Model) and Humanistic Approaches (Carl Rogers Approach);

UNIT-III

Counseling Process- 5-D Model, the Phases of Counseling Process, Counseling Environment and Procedure, and the Core Conditions of Counseling; Counselor's Attitude and Skills of Counseling- Verbal and Non-verbal Communication Modalities, Listening Skills, Listening Barriers and Strategies to Overcome Listening Barriers;

UNIT-IV

Organizational Applications of Counseling Skills- Identifying Problems and Coping Strategies with regard to Occupational Stress and Performance Management; Special Problems in Counseling- Selection of Counseling Strategies and Interventions, Changing Behavior through Counseling; Ethical and Legal Aspects of Counseling, and Current trends in Counseling

Suggested Readings:

1. Cormer, L.S., and Hackney, H., *The Professional Counselor's Process Guide Helping*, Englewood Cliffs, Prentice Hall Inc.
2. Moursund, J., *The Process of Counseling and Therapy*, Englewood Cliffs, Prentice Hall Inc.
3. Munro, C A, *Counseling: A Skills Approach*, Methuen.
4. Reddy, Michael, *Counseling at Work*, British Psychological Society and Methuen.
5. Rao, S. Narayana, *Counselling and Guidance*, Tata McGraw Hill.
6. Gladding, S. T, *Counseling- A Comprehensive Profession*, Pearson.
7. Singh, Kavita, *Counselling Skills for Managers*, Prentice Hall of India.

Important Instructions for the Course Coordinator and the Examiner:

- The list of cases and specific references including recent articles will be announced in the class at the time of launching of the course by the Course Coordinator.
- The examiner is required to cover all course outcomes framed for a particular course in a balanced manner while setting nine questions in all. The first question will be compulsory consisting of six short questions covering the entire syllabus. In addition, eight more questions will be set comprising two questions from each unit. Wherever possible, the examiner may give a case study that will be equal to one question only. The students shall be required to attempt five questions in all selecting one question from each unit in addition to the compulsory Question No. 1. All questions shall carry equal marks. The maximum time allotted for the major test is 03 (three) hours.

MCH-435 ORGANISATIONAL CHANGE AND INTERVENTION STRATEGIES

Time Allowed: 3 Hours

M.M:60

Course Objective: *The objective of this paper is to make the students learn about the organizational change and prepare them as change facilitators using the knowledge and techniques of behavioral science.*

Course Outcomes:

- CO1:** Students will be able to recall different concepts of organisation change and intervention strategies.
- CO2:** Students will be able to explain the process of organisation changes.
- CO3:** Students will be able to demonstrate the various intervention strategies.
- CO4:** Students will be able to appraise the process of organisation changes.
- CO5:** Students will be able to evaluate the role of change agents.
- CO6:** Students will be able to develop their own consultancy model for corporate sector.

Course Contents:

UNIT-I

Organizational Change: The domain of change, concept, Change Agents, Strategic management of change; Managerial approaches for implementing change; Models of Organizational Change, Kurt Lewin's Models of Change, Huse's 7 stages model of change

UNIT-II

Change Management: Understanding the Change Process, Facilitating Change, Dealing with Individual and Group Resistances, Intervention Strategies and Develop Learning Organization. Organizational Diagnosis- Meaning & Importance, Weisbord's model of Organizational Diagnosis and Methods of obtaining diagnostic information

UNIT-III

Organizational Development: An overview, Steps in OD process, General OD Competencies, OD Skills, Values, Assumption and Beliefs in OD; Designing OD Interventions- Interpersonal, Team, Intergroup, Structural and Comprehensive Interventions; Evaluation of Organizational Development Interventions

UNIT-IV

Organizational Culture & Change; Corporate Culture, Types of Culture, Importance, Nature, Formal & Informal Components of Organizational Culture, Designing for Cultural Change; Organizational Culture & Leadership; Emerging Trends in Organizational Culture; Ethics of OD Professionals and Future of OD.

Suggested Readings:

1. French, W. H. and Bell, *Organization Development*, Prentice Hall of India.
2. French, W. H., *Organization Development Theory, Practice and Research*, Prentice Hall of India.
3. Singh, K., *Organization Change and Development*, Excel Books
4. Huse, F. E. and Cummings, T. G., *Organization Development and Change*, West.
5. De Nitish, *Alternative Designs of Human Organizations*, Sage.
6. Harvey, D.F. and Brown, D.R., *An Experiential Approach to Organization Development*, Prentice Hall Inc.

Important Instructions for the Course Coordinator and the Examiner:

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- The examiner is required to cover all course outcomes framed for a particular course in a balanced manner while setting nine questions in all. The first question will be compulsory consisting of six short questions covering the entire syllabus. In addition, eight more questions will be set comprising two questions from each unit. Wherever possible, the examiner may give a case study that will be equal to one question only. The students shall be required to attempt five questions in all selecting one question from each unit in addition to the compulsory Question No. 1. All questions shall carry equal marks. The maximum time allotted for the major test is 03 (three) hours.

MCH-436 GLOBAL HUMAN RESOURCE MANAGEMENT**Time Allowed: 3 Hours****M.M:60**

Course Objective: *The objective of this course is to develop a diagnostic and conceptual understanding of the cultural and related behavioral variables in the Human Resource Management of global organizations.*

Course Outcomes:

CO1: Students will be able to describe the concept of global human resource management.

CO2: Students will be able to discuss the human and cultural variables in global organisations.

CO3: Students will be able to interpret the various dimensions of Hofstede's study.

CO4: Students will be able to compare various studies related to culture.

CO5: Students will be able to evaluate various HRM practices prevailing in various global organisations.

CO6: Students will be able to formulate negotiation process in cross cultural context.

Course Contents:**UNIT-I**

Human and Cultural Variables in Global Organizations: Culture and values, Cross Cultural Differences and Managerial Implications

UNIT-II

Cultures in Organizations and Hofstede's Study – Cultural dimensions and their HR and managerial implications

UNIT-III

Evolution of Global Organizations: Cross Cultural Leadership, Motivation and Decision Making, Cross Cultural Communication and Negotiation.

UNIT-IV

Human Resource Management in Global Organizations: Selection, Source criteria for International Assignment, Compensation and Appraisal System.

Suggested Readings:

1. Adler, N.J., *International Dimensions of Organizational Behaviour*, Kent Publications.
2. Bartlett, C. and Ghoshal, S., *Transnational Management: Text, Cases and Readings in Cross Border Management*, Irwin.
3. Dowling, P.J., *International Dimensions of Human Resource Management*, Wadsworth.
4. Hofstede, G., *Cultures Consequence: International Differences in Work Related Values*, Sage.
5. Marcis, D. & Puffer, S.M., *Management International: Cases, Exercises and Readings*, West Publishing.
6. Mead, R., *International Management: Cross Cultural Dimensions*, Blackwell.
7. Ronen, S., *Comparative and Multinational Management*, John Wiley.

Important Instructions for the Course Coordinator and the Examiner:

- The list of cases and specific references including recent articles will be announced in the class at the time of launching of the course by the Course Coordinator.
- The examiner is required to cover all course outcomes framed for a particular course in a balanced manner while setting nine questions in all. The first question will be compulsory consisting of six short questions covering the entire syllabus. In addition, eight more questions will be set comprising two questions from each unit. Wherever possible, the examiner may give a case study that will be equal to one question only. The students shall be required to attempt five questions in all selecting one question from each unit in addition to the compulsory Question No. 1. All questions shall carry equal marks. The maximum time allotted for the major test is 03 (three) hours.

**Scheme and Syllabi
of
Post Graduate Diploma of Computer
Applications
(PGDCA)**

One Year Programme

**CHOICE BASED CREDIT BASED SYSTEM
(80:20)**

(w.e.f. session 2019-20)



**Department of Computer Science & Engineering
Guru Jambheshwar University Science and Technology
Hisar**

SCHEME OF EXAMINATION P G D C A (Choice Based Credit System)

Semester I

Paper No	Nomenclature of Paper	Total Credits	No. of Hours
PGDCA101	Introduction to Information Technology	4	4
PGDCA102	Computer Programming Using C	4	4
PGDCA103	Operating Systems	4	4
PGDCA104	Database Management Systems	4	4
PGDCA105	Web Technologies	4	4
PGDCA106	Software Laboratory –I Programming using C	2	4
PGDCA107	Software Laboratory –II HTML and MS-Office	2	4
PGDCA108	Seminar	1	2
Total		25	44

Semester –II

Paper No	Nomenclature of Paper	Total Credits	No. of Hours
PGDCA201	Data Structure and Algorithms	4	4
PGDCA202	Computer Networks	4	4
PGDCA203	Object Oriented Systems and C++	4	4
PGDCA204	Computer Organization	4	4
PGDCA205	Software Engineering	4	4
PGDCA206	Software Laboratory –III Data structure implemented in C/C++	2	4
PGDCA207	Software Laboratory –IV Programming in C++	2	4
PGDCA208	Seminar	1	2
Total		25	44

Grand total of Credits (Semester I and II)	88

Note:

- 1) One credit in theory paper is equivalent to one hour classroom teaching per week.
- 2) One credit in practical/lab course is equivalent to 2 hours practical/lab work per week
- 3) A teacher will conduct practical class in a group of 15-20 students.

PGDCA101:Introduction to Information Technology

General Course Information:

Course Code: PGDCA101 Course Credits: 4 Type: Compulsory Contact Hours: 4 hours/week Mode: Lectures Exam Duration: 3hours	Course Assessment Methods (internal: 20; external: 80) Two minor examinations each of 15 marks, Class Performance measured through percentage of lectures attended (2 marks) Assignment and quiz (3 marks), and end semester examination of 80 marks. The syllabus is divided into four units. For the end semester examination, nine questions are to be set by the examiner. Question number one is compulsory and contains eight short answer questions covering entire syllabus. Rest eight questions are set by giving two questions from each of the unit of the syllabus. A candidate is required to attempt any of four questions selecting at least one from each of the four units. All questions carry equal marks.

About the Course and its Objectives & Outcomes:

The objectives of this course are

- To make student understand various components of computer and their working.
- Learn MS-Office and its components.
- To make student understand about Internet and Internet services.

By the end of the course a student is expected to:

- Learn how computer works and the importance of various components of computers.
- Understand about how Internet works.
- Select particular configuration of computer necessary for the application.

Syllabus

Unit I

Computer Fundamentals: Introduction to Computers: Characteristics and Limitations of Computers, Evolutions of Computers, Classification of Computers, Computer Languages, Types of software, Structured Programming Concepts.

Basic Computer Organization: Units of a computer, CPU, ALU, Memory Hierarchy, Registers, I/O devices, Mother Board.

Unit II

Word Processing: Introduction to MS-Word, Creating & Editing Text: Paragraph Formatting, Page Formatting, Template, Page, Views, Table; Advanced Features: Bookmark, Mail Merge, Macros.

Unit III

Spread Sheets: Introduction to MS-Excel, Creating & Editing Worksheet, Formatting data, Formulas and Functions, Creating Charts, Pivot Tables.

Power Point Presentations: Creating, Manipulating & Enhancing Slides, Organizational Charts, Animations & Sounds, Inserting Animated Pictures

Unit IV

Internet Basics: History of Internet, Web Browsers, Web Servers, Hypertext Transfer Protocol, Internet Protocols Addressing, Internet Connection Types, How Internet Works, ISPs, Search Engines, Emails and Its Working, Internet Security, Uses of Internet, Computer Networks and their

advantages, Types of Computer Network, Network Topologies, Basics of Transmission Media; Cloud Computing Basics: Overview, Applications, Intranets and the Cloud; Benefits, Limitations and Security Concerns.

Text and Reference Books:

- Satish Jain, Kratika, M. Geetha, “MS Office”, BPB Publications, 2010.
- ITL Education Solutions Limited, “Introduction to Computer Science”, Pearson Education, 2nd Edition 2012.
- P. K. Sinha, “Computer Fundamentals”, 6th edition, 2003
- Tony Feldman, “Introduction to Digital Media”, Routledge; 1 edition, 1996.
- Bartee, Thomas C, “Digital Computer Fundamentals”, McGraw-Hill Inc., 6th Edition, 1984

PGDCA102:Computer Programming Using C

General Course Information:

Course Code: PGDCA102 Course Credits: 4 Type: Compulsory Contact Hours: 4 hours/week Mode: Lectures Exam Duration: 3hours	Course Assessment Methods (internal: 20; external: 80) Two minor examinations each of 15 marks, Class Performance measured through percentage of lectures attended (2 marks) Assignment and quiz (3 marks), and end semester examination of 80 marks. The syllabus is divided into four units. For the end semester examination, nine questions are to be set by the examiner. Question number one is compulsory and contains eight short answer questions covering entire syllabus. Rest eight questions are set by giving two questions from each of the unit of the syllabus. A candidate is required to attempt any of four questions selecting at least one from each of the four units. All questions carry equal marks.

About the Course and its Objectives & Outcomes:

The objectives of this course are to make students to understand programming language, concepts of structured programming, Control structures, Stepwise refinement, Functions, Arrays, and Pointers etc. The main emphasis of the course will be on problem solving aspect i.e. developing proper algorithms.

By the end of the course a student is expected to:

- Use the various constructs of a programming language.
- Write program in 'C' language to solve a problem.
- Implement the algorithms in 'C' language.
- Handle Files in 'C'

Syllabus

Unit I

Programming process: Problem definition, Algorithm development, Flowchart, Program Coding, compilation, debugging, testing and execution, Types of errors.

C Programming Fundamentals: Identifiers and keywords, Structure of C Program data types, input and output, type conversion.

Unit II

Operators & Expressions: Arithmetic, unary, logical and relational operators, assignment operator, Bit-wise, conditional operator, library functions.

Control statements: Decision making using if, if-else, Nested IF, Else If Ladder switch, break, continue statement and goto Statement, looping using for, while and do-while statements, nested loops.

Unit III

Functions: Library functions, Defining & accessing User defined functions, function prototype and passing arguments to a function, recursion versus iteration. Macro vs function.

Arrays: Definition, accessing elements, initialization, passing to functions, multi-dimensional arrays, Strings & operations of Strings, String Handling through Built-in and User Defined Functions. Pointers declaration, assignment, Pointer Arithmetic, passing pointer to functions, pointer arrays, Dynamic Memory Allocation.

Unit IV

Structure and Union: Defining and Initializing Structure, accessing members, nested structures, pointer to structures, self-referential structures, Unions: Introduction to Unions and its Utilities.

File Handling and Storage classes: automatic, register, external and static variables; Opening and Closing file in C, Modes of File, Reading and Writing data to a file.

Text and Reference Books:

- E.Balaguruswamy, “Programming in C”, TMH.
- Y.Kanetkar, “Let Us C” BPB Publication.
- Byron Gottfried, “Programming with C”, Schaum’s outline series” TMH.

PGDCA103: Operating Systems

General Course Information:

Course Code:PGDCA103 Course Credits: 4 Type: Compulsory Contact Hours: 4 hours/week Mode: Lectures Exam Duration: 3hours	Course Assessment Methods (internal: 20; external: 80) Two minor examinations each of 15 marks, Class Performance measured through percentage of lectures attended (2 marks) Assignment and quiz (3 marks), and end semester examination of 80 marks. The syllabus is divided into four units. For the end semester examination, nine questions are to be set by the examiner. Question number one is compulsory and contains eight short answer questions covering entire syllabus. Rest eight questions are set by giving two questions from each of the unit of the syllabus. A candidate is required to attempt any of four questions selecting at least one from each of the four units. All questions carry equal marks.

About the Course and its Objectives & Outcomes:

The objective of this course is to help students become familiar with the fundamental concepts of operating systems and provide students with sufficient understanding of operating system design.

By the end of the course a student is expected to:

- Exhibit familiarity with the fundamental concepts of operating systems.
- Exhibit competence in recognizing operating systems features and issues.

Syllabus

Unit I

Introductory Concepts: Operating systems functions and characteristics, operating system structure, operating system services, system calls, system programs. Types of Operating system: Batch operating system, Time-sharing operating system, Distributed operating system, Real time systems

Process Management: Process concept, Process States, Process Control Block, Cooperating processes.

Unit II

CPU scheduling: Levels of Scheduling, Scheduling criteria, Comparative study of scheduling algorithms, Multiple processor scheduling.

Concurrent Processes: Critical section problem, Semaphores, Classical process co-ordination problems and their solutions, Monitors, Inter-process Communications.

Unit III

Deadlock: System model, Deadlock characterization, Methods for handling Deadlocks: Deadlock prevention, Deadlock avoidance, Deadlock detection, Recovery from Deadlock.

Storage Management: Storage allocation methods: Single contiguous allocation, Multiple contiguous allocation, Paging; Segmentation combination of Paging and Segmentation, Virtual memory concepts, Demand Paging, Page replacement Algorithms, Thrashing.

Unit – IV

Device and file management: Disk scheduling, Disk structure, Disk management, File Systems: Functions of the system, File access and allocation methods, Directory Systems: Structured Organizations, directory and file protection mechanisms.

Case Studies: Comparative study of WINDOW, UNIX, ANDROID & LINUX system.

Text and References Books:

- D.M.Dhamdhare, “Operating systems- A Concept based Approach”, 2nd Edition.TMH
- Silberschatz, Galvin and Gagne, “Operating System Concepts”, Sixth Edition, Wiley India Pvt. Ltd.
- Andrew S.Tanenbaum,“Modern Operating Systems”, Second Edition, Pearson Education.
- Harvey M. Deital, “Operating Systems”, Third Edition, PearsonEducation.
- Godbole, A.S., “Operating Systems”, Tata McGraw-Hill Publishing Company, New Delhi.

PGDCA104: Database Management Systems

General Course Information:

Course Code: PGDCA104 Course Credits: 4 Type: Compulsory Contact Hours: 4 hours/week Mode: Lectures Exam Duration: 3hours	Course Assessment Methods (internal: 20; external: 80) Two minor examinations each of 15 marks, Class Performance measured through percentage of lectures attended (2 marks) Assignment and quiz (3 marks), and end semester examination of 80 marks. The syllabus is divided into four units. For the end semester examination, nine questions are to be set by the examiner. Question number one is compulsory and contains eight short answer questions covering entire syllabus. Rest eight questions are set by giving two questions from each of the unit of the syllabus. A candidate is required to attempt any of four questions selecting at least one from each of the four units. All questions carry equal marks.

About the Course and its Objectives & Outcomes:

The objectives of this course are

- To provide comprehensive coverage of the problems involved in database design, in-depth coverage of data models and database languages, and a survey of implementation techniques applied in modern DBMS.
- To provide practical skills of conceptual/logical database design and general familiarity with the problems and issues of database management.
- To develop skills that is appropriate for Database Administrators, Database Application Developers, Database Specialists, and DBMS developers.

By the end of the course a student is expected to be familiar with:

- The basic concepts and appreciate the applications of database systems.
- The basics of SQL and construct queries using SQL.
- A relational database system theory and be able to design database based on relational data model.

Syllabus

Unit I

Overview: File Systems vs. DBMS, Characteristics of the Data Base Approach, Database users, Advantages and Disadvantages of a DBMS, Responsibility of Database Administrator.

Data Base Systems Concepts and Architecture: Data Models, Schemas and Instances, DBMS architecture and various views of Data, Data Independence, Database languages.

Unit II

Entity Relationship Model: Basic Concepts-Entity, Attributes, Types of Attributes, Entity set and Keys, Relationships-Relationship set, Degree of Relationship, Roles and Structural Constraints, E-R Diagrams, Reduction of an E-R Diagram to Tables, Binary Representation and Cardinality, Participation Constraints

Unit III

Relational Data Model:-Brief History, Relational Model Terminology-Relational Data Structure, Database Relations, Properties of Relations, Keys, Domains, Integrity Constraints over Relations, Base Tables and Views.

Unit IV

SQL: Introduction to SQL, Data Types in SQL, Common Commands in SQL- Select, Insert, Update and Delete, views in SQL; Relational Database Design: Functional Dependencies, Decomposition, Desirable properties of decomposition, Normal Forms (1 NF, 2 NF, 3 NF and BCNF).

Text and Reference Books:

- Elmasri&Navathe,“Fundamentals of Database Systems”, 3rd Edition, Addison Wesley, New Delhi.
- R.Pannerselvam,“Database Management Systems”,2nd Edition, PHI Learning Pvt. Ltd., New Delhi, 2011
- Bipin C. Desai,“An Introduction to Database System”, Galgotia Publication, New Delhi
- Korth and Silberschatz ,“Database System Concept”, 4th Edition, McGraw Hill International Edition

PGDCA105: Web Technologies

General Course Information:

Course Code: PGDCA105 Course Credits: 4 Type: Compulsory Contact Hours: 4 hours/week Mode: Lectures Exam Duration: 3hours	Course Assessment Methods (internal: 20; external: 80) Two minor examinations each of 15 marks, Class Performance measured through percentage of lectures attended (2 marks) Assignment and quiz (3 marks), and end semester examination of 80 marks. The syllabus is divided into four units. For the end semester examination, nine questions are to be set by the examiner. Question number one is compulsory and contains eight short answer questions covering entire syllabus. Rest eight questions are set by giving two questions from each of the unit of the syllabus. A candidate is required to attempt any of four questions selecting at least one from each of the four units. All questions carry equal marks.

About the Course and its Objectives & Outcomes:

The objectives of this course are

- Learn HTML and design various web pages.
- Learn tags and its uses in web designing process with HTML.

By the end of the course a student is expected to be familiar with:

- Become skilled at Web Designing Complete Process.
- Make Web Pages using tags in HTML.
- Get proficient in using HTML.

Syllabus

Unit I

Introduction to Internet and World Wide Web; Evolution and History of World Wide Web; Basic features; Web Browsers; Web Servers; Hypertext Transfer Protocol; URLs; Searching and Web-Casting Techniques; Search Engines and Search Tools.

Unit II

Web Publishing: Hosting your Site; Internet Service Provider; Planning and designing your Web Site; Steps for developing your Site; Choosing the contents; Home Page; Domain Names; Creating a Website; Website and its Categories.

Unit III

Web Development: Introduction to HTML; Hypertext and HTML; HTML Document Features; HTML Document structure; HTML command Tags; Creating Links; Heading tags; Text styles; Text Structuring; Text colors and Background colors; Text Formatting; Page Layouts.

Unit IV

Images; Inserting Graphics; Images as Hyperlinks; Ordered and Unordered lists; Table Creation and Layouts; Frame Creation and Layouts; Working with Forms and Menus; Working with Radio Buttons; Check Boxes; Text Boxes.

Text and Reference Books:

- Raj Kamal, “Internet and Web Technologies”, Tata McGraw-Hill.
- Ramesh Bangia, “Multimedia and Web Technology”, Firewall Media.
- Thomas A. Powell, “Web Design: The Complete Reference”, 3-edition, Tata McGraw-Hill.
- Wendy Willard, “HTML: A Beginners Guide”, Tata McGraw-Hill.
- Deitel and Goldberg, “Internet and World Wide Web, How to Program”, PHI.

PGDCA106: Software Laboratory –I

Programming in C

General Course Information:

Course Code: PGDCA106 * Course Credits: 2 Type: Compulsory Contact Hours: 4 hours/week Mode: Experimental Lab. * In lab work one credit is equivalent to two hours	Course Assessment Methods (internal: 20; external: 80) An internal practical examination is conducted by the course coordinator. The end semester practical examination is conducted jointly by external and internal examiners. External examiner is appointed by the COE of the university from the panel of examiners approved by BOSR of the Department of Computer Science and Engineering, Hisar and the internal examiner is appointed by the Chairperson of the Department.

Pre-requisites:

Students are expected to have the strong theoretical concepts and computer fundamentals as well as capability to develop logic, to write algorithm and draw flowchart.

The objectives of this lab.course are to:

- Provide a way to interact and understand the way a computer works.
- Learn how to input data for a given problem from keyboard and obtain outputs from monitor.

By the end of the course a student is expected to be able to:

- Write code for a given problem in „C“ language.
- Present results in an informative way

Students are given eight to ten laboratory assignments with soft and hard deadlines. The lab assignments are evenly spread over the semester. Every student is required to prepare a file of laboratory experiments done

List of Laboratory Assignments:

1. Write a program to find ASCII value of a character.
2. Write a program to swap two numbers without using third variable.
3. Write a program to check whether a number is Even or Odd.
4. Write a program to find largest among three numbers without using if.
5. Write a program to display Fibonacci sequence.
6. Write a program to print first ten prime numbers.
7. Write a program to check number is Armstrong or not using while.
8. Write a program to design a simple calculator using switch.
9. Write a program to find largest and smallest using global declaration.
10. Write a program to find factorial of a Number using recursion.
11. Write a program to reverse a String.
12. Write a program to find number is int or float.
13. Write a program to find largest and smallest element of an array.
14. Write a program to find addition of two matrices.
15. Write a program to find Multiplication of two Matrices.

16. Write a program to check matrix is sparse or not.
17. Write a program to perform concatenation of strings using pointers.
18. Write a program to implement structures.
19. Write a program to add two numbers using pointers.
20. Write a program to read and write data in a file.

PGDCA107: Software Laboratory –II

HTML and MS-Office

General Course Information:

Course Code: PGDCA106 * Course Credits: 2 Type: Compulsory Contact Hours: 4 hours/week Mode: Experimental Lab. * In lab work one credit is equivalent to two hours	Course Assessment Methods (internal: 20; external: 80) An internal practical examination is conducted by the course coordinator. The end semester practical examination is conducted jointly by external and internal examiners. External examiner is appointed by the COE of the university from the panel of examiners approved by BOSR of the Department of Computer Science and Engineering, Hisar and the internal examiner is appointed by the Chairperson of the Department.

Pre-requisites:

Students are expected to have basic knowledge of computers.

The objectives of this lab.course are to:

- To design web pages using different tags in HTML.
- To understand the Office Packages.
- To have hands on knowledge of MS Word and MS Excel.
- To have practical knowledge of MS PowerPoint.

By the end of the course a student is expected to be able:

- Use MS-Word to create resume, letters, tables etc.
- Use MS-Excel to store numerical data and perform calculations on it.
- Use MS-PowerPoint to create professional presentation.
- Design web pages of web sites using HTML language.

Students are given ten or more laboratory assignments with soft and hard deadlines. The lab assignments are evenly spread over the semester. Every student is required to prepare a file of laboratory experiments done.

List of Laboratory Assignments:

1. Write a HTML code to show body, title, text formatting, color and background color tag.
2. Write a program in HTML to create a web page to show comment and H1-----H6 tags.
3. Write a HTML code to illustrate the usage of the following
 - a. Ordered List
 - b. Unordered List
 - c. Definition List
4. Write a program in HTML to show map of India.
5. Write a HTML code to display your education details in a tabular format.
6. Write a HTML code to create a Homepage having three links: About Us, Our Services and Contact Us. Create separate web pages for the three links.

7. Write a HTML code to create a Registration Form. On submitting the form, the user should get navigated to a profile page.
8. Write a program in HTML to create a webpage with four frames.
9. Create a class timetable using table option in MS- Word.
10. Using MS-Word, create personal letter and company letter.
11. Use mail merge to create a form letter.
12. Make your resume in MS-Word.
13. Create a presentation in MS PowerPoint on any topic of your choice with animation and transition effects.
14. Enter the data given below into a worksheet.

	A	B	C	D	E
1	Stationery Supplies Ltd				
2					
3	Date	SalesPerson	Item	Receipt No	Amount
4	21-Nov	Carl	Toys	1238	1,782.10
5	26-Nov	Carl	Stationery	1255	4,853.55
6	26-Nov	Carl	Toys	1395	51.35
7				Carl's Total	
8	21-Nov	John	Cards	1141	91.15
9	24-Nov	John	Books	1982	442.60
10	21-Nov	John	Toys	1885	561.50
11	26-Nov	John	Toys	1875	62.75
12				John's Total	
13	22-Nov	Judy	Books	1032	234.50
14	26-Nov	Judy	Sports goods	1920	472.60
15				Judy's Total	
16	25-Nov	Mary	Toys	1774	364.15
17				Mary's Total	
18	22-Nov	Susan	Electronics	1160	52.95
19	23-Nov	Susan	Cards	1075	81.60
20	23-Nov	Susan	Others	1745	132.95
21	24-Nov	Susan	Sports goods	1662	2,580.10
22				Susan's Total	
23					
24				Grand Total	

- (i). Calculate the totals for each salesperson and get the grand total;
 - (ii). Format the worksheet as follows:
Make all the Totals bold, two decimal places, comma, center the title across columns A-E and make it size 16, bold and Italic.
 - (iii). Put a double border round the whole table and a single line border inside the table.
 - (iv). Save the worksheet as **Stationery Analysis**.
15. Using the information given in the table below, calculate the amount and total amount payable by the company to the employees.

	A	B	C	D	E
1	Services Company Ltd				

2	Overtime Details				
3	Date	Name	Hours Worked	Rate	Amount
4	26-Nov	Kennedy	5	70	
5	26-Nov	Kennedy	5	100	
6	26-Nov	Mary	5	100	
7	26-Nov	Lewis	4	100	
8	30-Nov	Judy	3	100	
9	30-Nov	Kennedy	6	70	
10	30-Nov	Lewis	5	100	
11	30-Nov	Kennedy	4	70	
12	30-Nov	Judy	5	100	
13	30-Nov	Lewis	5	100	
14	02-Dec	Judy	4	70	
15			Total Amount		

PGDCA108 Seminar

General Course Information:

Course Code: PGDCA108 *Course Credits: 1 Type: Compulsory Contact Hours: 2 hours/week Mode: Lab. *In lab work one credit is equivalent to two hours	Course Assessment Methods (internal: 100) An internal examination is conducted by the assigned teacher on regular basis in lab and based evaluation is done by the teacher.

The objectives of this Seminar course are to:

- Understanding of the basics of the application of the various models of verbal and non-verbal communication in the social and professional sphere
- Develop the following skills in the students-
 - Communication Skills
 - Presentation Skills
 - Active Listening etc.

By the end of the course a student is expected to be able:

- To understanding the importance of intonation, word and sentence stress for improving communicative competence, identifying and overcoming problem sounds.
- To establish a repo with the audience.
- To present his/her ideas clearly and confidently.
- To address the queries from the audience.

General Guidelines:

- Students are required to prepare a presentation.
- The content of presentation can be on any topic from the core subject.
- Students are required to submit hard as well as soft copy of the presentation to the concerned teacher.

PGDCA201: Data Structures and Algorithms

General Course Information:

Course Code: PGDCA201 Course Credits: 4 Type: Compulsory Contact Hours: 4 hours/week Mode: Lectures Exam Duration: 3hours	Course Assessment Methods (internal: 20; external: 80) Two minor examinations each of 15 marks, Class Performance measured through percentage of lectures attended (2 marks) Assignment and quiz (3 marks), and end semester examination of 80 marks. The syllabus is divided into four units. For the end semester examination, nine questions are to be set by the examiner. Question number one is compulsory and contains eight short answer questions covering entire syllabus. Rest eight questions are set by giving two questions from each of the unit of the syllabus. A candidate is required to attempt any of four questions selecting at least one from each of the four units. All questions carry equal marks.

Pre-requisites:

Students are expected to have knowledge of programming in a standard programming language like C.

About the Course and its Objectives & Outcomes:

The objectives of this course are to

- Achieve an understanding of fundamental data structures, which allow one to store collections of data with fast updates and queries
- Study theoretical analysis, implementation and application of data structures, and
- Learn tradeoffs between different implementations of these abstractions.

By the end of the course a student is expected to:

- Design algorithms for various computing problems.
- Analyze the time and space complexity of algorithms.
- Efficiently implement your solution using programming language C.

Syllabus

Unit I

Introduction: Data Structures Definition and its types, Data Structure operations, Static and dynamic memory storage, Algorithms complexity and time-space tradeoff, Big-O notation.

Strings: Introduction, storing strings, String operations, Pattern matching algorithms.

Unit II

Arrays: one-dimensional arrays, matrices, sparse matrices, multi-dimensional arrays, operations on arrays, Linear search, Binary search, Insertion sort, selection sort, Bubble sort, Merge sort.

Linked List: Array vs linked list, Types (singly, doubly, singly circular, header, doubly circular,), Operations on Lists – create, insert, delete, search, Applications of linked lists.

Unit III

Stack: Definition, Array implementation of stacks, Linked implementation of stacks, Applications of Stacks: Infix, Postfix and prefix expression, conversions and evaluation of expressions, Recursion, Quick Sort.

Queue: Definition, Array implementation of queues, Linked implementation of queues, Circular queues, Priority queues, Double-ended queues, Applications of queue.

Unit IV

Trees: Binary Trees and their properties, Linked and static Representation of binary trees, Complete Binary Tree, Threaded Binary tree, Different tree traversal algorithms, Binary Search Tree (create, delete, search, insert, display), Heap Sort and its complexity analysis, Introduction to AVL Trees and Balanced multi-way search trees.

Graph: Definition, Array and linked representation of graphs, Graph Traversal (BFS and DFS), Adjacency matrix and adjacency lists, path matrix, Finding Shortest Path - Warshall's Algorithm.

Text and Reference Books:

- Seymour Lipschutz, “Data Structures”, Tata McGraw- Hill Publishing Company Limited, Schaum’s Outlines, New Delhi.
- YedidyanLangsam, Moshe J. Augenstein, and Aaron M. Tenenbaum, “Data Structures Using C”, Pearson Education., New Delhi.
- BalaGuruswamy, “Data Structures Using C”, TMH.
- Mark Allen Weiss, “Data Structures and Algorithm Analysis in C”, Addison- Wesley.

PGDCA202: Computer Networks

General Course Information:

Course Code: PGDCA202 Course Credits: 4 Type: Compulsory Contact Hours: 4 hours/week Mode: Lectures Exam Duration: 3hours	Course Assessment Methods (internal: 20; external: 80) Two minor examinations each of 15 marks, Class Performance measured through percentage of lectures attended (2 marks) Assignment and quiz (3 marks), and end semester examination of 80 marks. The syllabus is divided into four units. For the end semester examination, nine questions are to be set by the examiner. Question number one is compulsory and contains eight short answer questions covering entire syllabus. Rest eight questions are set by giving two questions from each of the unit of the syllabus. A candidate is required to attempt any of four questions selecting at least one from each of the four units. All questions carry equal marks.

Prerequisite:

Student is required to have the knowledge of Data representation, Digital and Control Logic, Memory Hierarchy, Input/ output devices and overall system design.

About the Course and its Objectives & Outcomes:

The objectives of this course are:

- To introduce to various types of Networks. Networks relates to the Communication among various Gadgets and Networking devices.
- To understand the OSI model for Networks that defines collection of protocols for the related communication.
- To learn various wired and wireless connections for communication.

By the end of the course a student is expected to:

- Able to understand the nature of computer network.
- Able to identify the type of Network in the work environment and identify the protocols at various layers.
- Define OSI reference models and its layers.

Syllabus

Unit I

Introduction: Computer Communications and Networking Technologies; Uses of Computer Networks; Network Devices: Nodes, and Hosts; Types of Computer Networks and their Topologies; Network Software: Network Design issues and Protocols; Connection-Oriented and Connectionless Services; Computer Communications and Networking Models: Decentralized and Centralized Systems, Distributed Systems, Client/Server Model.

Unit II

OSI Reference Model: Physical, Data Link, Network, Transport, Session, Presentation and Application layer; Advantages and Disadvantages of OSI model; Example Networks: Internet, ATM.

Unit III

Network hardware components: Connectors, Transceivers, Network Interface Cards, Hubs, Switches, Repeater, Bridges, Routers, Gateways; Transmission media: Guided- Twisted, Co-axial, Fiber –optic cable, Unguided-Radiowaves, Microwaves, Infrared Transmission, Wired versus Wireless Networks.

Unit IV

Analog and Digital Communications Concepts: Representing Data as Analog Signals, Representing Data as Digital Signals, Data Rate and Bandwidth, Capacity, Baud Rate; Digital Carrier Systems; Communication Satellites; Switching and Multiplexing; Dialup Networking, Broadband Connection, Wireless Connection.

Text and Reference Books:

- Andrew s. Tanenbaum, “Computer Networks”, PHI.
- Fred Halsall, “Data Communications, Computer Networks and Open Systems”, fourth edition, Addison Wesley.
- Behrouz, Forouzan, “Introduction to Data Communications and Networking”, Tata Mc-Graw Hill.
- William Stallings, “Data and Computer Communications”, fifth edition, PHI.

PGDCA203: Object Oriented Systems and C++

General Course Information:

Course Code: PGDCA203 Course Credits: 4 Type: Compulsory Contact Hours: 4 hours/week Mode: Lectures Exam Duration: 3hours	Course Assessment Methods (internal: 20; external: 80) Two minor examinations each of 15 marks, Class Performance measured through percentage of lectures attended (2 marks) Assignment and quiz (3 marks), and end semester examination of 80 marks. The syllabus is divided into four units. For the end semester examination, nine questions are to be set by the examiner. Question number one is compulsory and contains eight short answer questions covering entire syllabus. Rest eight questions are set by giving two questions from each of the unit of the syllabus. A candidate is required to attempt any of four questions selecting at least one from each of the four units. All questions carry equal marks.

Pre-requisites: Basic knowledge of C language concepts like Data-Types, Loops, Array, Structure etc.

About the Course and its Objectives & Outcomes:

The objectives of this course are to:

- Understand the advanced programming concepts of OOPS.
- Develop efficient applications with greater ease using the concepts like Abstraction, Encapsulation, Polymorphism and Inheritance.

By the end of the course a student is expected to:

- Design and Develop different computer software applications.
- Implementation of various algorithms in programming languages for research purpose

Syllabus

Unit 1

Introduction to object oriented programming: Procedural vs Object oriented programming Characteristics of OOP; Classes& Object, Data encapsulation and Abstraction, Polymorphism, Inheritance, Dynamic Binding and message passing, OOPs Application, Structure of C++ Program ,Data types ,Variables, Operators, Namespaces, Enums, Type Conversion, Control Statements Arrays, Strings, Structure, Pointers.

Unit II

Introduction to Class: Struct vs. Classes, Class Definition, Classes and Objects, Access Specifiers: Private, Public and Protected, Member functions of the class, Constructor and Destructor, Parameterized Constructor, Copy Constructors. Inheritance: Reusability, Types of Inheritance: Single inheritance, Multiple, Multilevel, Hybrid Inheritance, Public, Private, and Protected Derivations, Using derived class, Constructor and destructor in derived class, Object initialization and conversion, Nested classes (Container classes), Virtual Inheritance and Virtual base class.

Unit III

Polymorphism and Exception Handling: Function Overloading, Static Class Members, Static Member Functions, Friend Functions, Operator Overloading: Unary and Binary Operator Overloading. Abstract class, Virtual function, Pure virtual function, Overloading vs. Overriding. Memory management: new, delete, object Creation at Run Time, This Pointer. Exception handling: Throwing, Catching, Re-throwing an exception, specifying exceptions, processing unexpected exceptions, Exceptions when handling exceptions, resource capture and release.

UNIT IV

Templates and Files: Introduction, Class templates and Function templates, Overloading of template function, namespaces. Introduction to STL: Standard Template Library: benefits of STL, containers, adapters, iterator, vector, list. Working with files: C++ streams, C++ stream classes, creating, opening, closing and deleting files, file pointers and their manipulators, updating file, random access to file, Error handling during file operations.

Text and Reference Books:

- Herbert Schildt, “C++ - The Complete Reference”, Tata McGraw Hill Publications.
- E. Balaguruswamy, “C++”, Tata McGraw Hill Publications.
- E. Balaguruswamy, “Object Oriented Programming and C++”, TMH.
- Shah and Thakker, “Programming in C++”, ISTE/EXCEL.
- Johnston, “C++ Programming Today”, PHI.
- Olshevsky, “Revolutionary Guide to Object Oriented Programming Using C++”, SPD/WROX.
- R.Rajaram, “Object Oriented Programming and C++”, New Age International.

PGDCA204: Computer Organization

General Course Information:

Course Code: PGDCA204 Course Credits: 4 Type: Compulsory Contact Hours: 4 hours/week Mode: Lectures Exam Duration: 3hours	Course Assessment Methods (internal: 20; external: 80) Two minor examinations each of 15 marks, Class Performance measured through percentage of lectures attended (2 marks) Assignment and quiz (3 marks), and end semester examination of 80 marks. The syllabus is divided into four units. For the end semester examination, nine questions are to be set by the examiner. Question number one is compulsory and contains eight short answer questions covering entire syllabus. Rest eight questions are set by giving two questions from each of the unit of the syllabus. A candidate is required to attempt any of four questions selecting at least one from each of the four units. All questions carry equal marks.

Prerequisites:

Students are expected have the elementary knowledge about computers.

About the course objectives and outcomes:

The objectives of this course are to:

- Basic understanding of computer organization: roles of processors,
- Understanding the concept of information Representation.
- Understanding arithmetic and logical operations with integer operands.
- To understand digital, binary, combinational, sequential logic.

By the end of the course a student is expected to be able:

- To solve basic binary math operations using the computer.
- To demonstrate programming proficiency using the various addressing modes and data transfer instructions of the target computer.
- To apply knowledge of the processor's internal registers.

Syllabus

Unit I

Information Representation: Number Systems, Binary Arithmetic Operations, Fixed-point and Floating point representation of numbers, BCD, ASCII, EBCDIC, Grey Code.

Unit II

Binary Logic: Boolean Algebra, Duality Principal, Boolean Theorems, Boolean Functions Truth Tables, De Morgan's Law, Simplification of Boolean Functions using Venn Diagram, Karnaugh Maps, Digital Logic: Logic Gates -AND, OR, NOT, Universal Gates - NAND, NOR, others-XOR, XNOR.

Unit III

Combinational Logic: Design Procedure, Adders, Subtractors, Encoders, Decoders, Multiplexers and De-multiplexers. Sequential Logic: Flip-flops, Registers and Counters.

Unit IV

Basic Computer Organization: Instruction Code, Computer Registers, Computer instructions, Timing and control, Instruction Cycle.

CPU organization: General Register Organization, Stack Organization, Instruction Formats, Addressing Modes.

Text and References Books:

- Mano, M. Morris, “Digital Logic and Computer Design”, Prentice Hall of India Pvt. Ltd.
- V. Rajaraman, T. Radhakrishnan, “An Introduction to Digital Computer Design”, Prentice Hall of India Pvt. Ltd.
- Mano, M. Morris, “Computer System Architecture”, Prentice Hall of India Pvt. Ltd.
- Andrew S. Tanenbaum, “Structured Computer Organization”, Prentice Hall of India Pvt. Ltd.

PGDCA205: Software Engineering

General Course Information:

Course Code: PGDCA205 Course Credits: 4 Type: Compulsory Contact Hours: 4 hours/week Mode: Lectures Exam Duration: 3hours	Course Assessment Methods (internal: 20; external: 80) Two minor examinations each of 15 marks, Class Performance measured through percentage of lectures attended (2 marks) Assignment and quiz (3 marks), and end semester examination of 80 marks. The syllabus is divided into four units. For the end semester examination, nine questions are to be set by the examiner. Question number one is compulsory and contains eight short answer questions covering entire syllabus. Rest eight questions are set by giving two questions from each of the unit of the syllabus. A candidate is required to attempt any of four questions selecting at least one from each of the four units. All questions carry equal marks.

Pre-requisites:

Students are expected to have knowledge of algorithms, flow charts and at least one programming language.

About the Course and its Objectives & Outcomes:

The objectives of this course are to:

- Introduce students to software development life cycle and models for developing and effective and efficient software
- Identify software requirements for manual or automated real-world systems
- Compare and contrast software process models and software development methodologies
- Moreover, student will learn the skill of software requirement specification and software quality assurance techniques

By the end of the course a student is expected to:

- Describe the software development life cycle as well as describing the various software development model and understand the advantages and disadvantages of each model;
- Illustrate the software requirement specification, Effort estimation
- Understand the use of model checking and be able to use it effectively.

Syllabus

Unit I

Introduction: Program vs. Software, Software Engineering paradigms, Software Crisis – problem and causes.

Phases in Software development: Requirement, Analysis, Software Design, Coding, Testing, Maintenance.

Software Development Process Models: Waterfall, Prototype, Evolutionary and Spiral models.

Unit II

Software Requirement Analysis and Specifications: Feasibility Study Software Requirements, Need for SRS, Characteristics of an SRS, Components of an SRS, Structure of a requirements

document, validation and metrics, Problem Analysis, Data Flow Diagram, Data Dictionary, Decision table, Decision trees.

Unit III

Software Project Planning: Process Planning, Effort estimation, COCOMO model, Project scheduling and Staffing, team structure, Software configuration management, Quality assurance plans, Risk Management, Project monitoring plans.

Software Implementation and Maintenance: Type of maintenance, Management of Maintenance, Maintenance Process, maintenance characteristics.

Unit IV

Testing: Testing fundamentals, Error, Fault, and Failure, Test Oracle, Test Case and Test Criteria, Psychology of testing, Black Box Testing, Boundary value analysis, Equivalence Class Partitioning, Decision Table based testing, Cause effect graphing, White box testing , Control flow based criteria, level of testing, Unit testing, Integration testing, System testing, Validation testing, alpha, beta, and Acceptance testing.

Text and Reference Books:

- Pressman R. S., “Software Engineering – A Practitioner’s Approach”, Tata McGraw Hill.
- Jalote P., “An Integrated approach to Software Engineering”, Narosa.
- Sommerville, “Software Engineering”, Pearson Education.
- Fairley R., “Software Engineering Concepts”, Tata McGraw Hill.

PGDCA206: Software Laboratory –III
Data structure implemented in C/C++

General Course Information:

Course Code: PGDCA206 * Course Credits: 2 Type: Compulsory Contact Hours: 4 hours/week Mode: Experimental Lab. * In lab work one credit is equivalent to two hours	Course Assessment Methods (internal: 20; external: 80) An internal practical examination is conducted by the course coordinator. The end semester practical examination is conducted jointly by external and internal examiners. External examiner is appointed by the COE of the university from the panel of examiners approved by BOSR of the Department of Computer Science and Engineering, Hisar and the internal examiner is appointed by the Chairperson of the Department.

Pre-requisites:

Students are expected to have the strong theoretical concepts and computer fundamentals as well as are expected to be proficient in programming language like “C or C++”.

The objectives of this lab.course are to:

- Learn how to implement data structure in a programming language.
- Make the students familiar with various operations on data.
- Learn the students how to deal with memory management.

By the end of the course a student is expected to be able to:

- Make a differentiation in abstract data type and dynamic data type.
- Model real world data aggregations using different data structures.

Students are given ten or more laboratory assignments with soft and hard deadlines. The lab assignments are evenly spread over the semester. Every student is required to prepare a file of laboratory experiments done.

List of Laboratory Assignments:

1. Write a program to insert an element in an array.
2. Write a program to delete an element from an array.
3. Write a program for Pattern Matching Algorithm.
4. Write a program for Bubble Sort/ Selection Sort/ Insertion Sort.
5. Write a program for Linear Search/ Binary search.
6. Write a program to insert a node in linked list at beginning, end, after a given node, before a given node.
7. Write a program to delete the starting node, last node or a given node from a linked list.
8. Write a program to implement push and pop operation in a stack using array.
9. Write a program to implement push and pop operation in stack using Linked List.
10. Write a program for Quick Sort.
11. Write a program to insert and delete an element in Queue using array.
12. Write a program to insert and delete an element in Queue using Linked List.
13. Write a program for tree traversal.

PGDCA207: Software Laboratory –IV
Programming in C++

General Course Information:

Course Code: PGDCA206 *Course Credits: 2 Type: Compulsory Contact Hours: 4 hours/week Mode: Experimental Lab. *In lab work one credit is equivalent to two hours	Course Assessment Methods (internal: 20; external: 80) An internal practical examination is conducted by the course coordinator. The end semester practical examination is conducted jointly by external and internal examiners. External examiner is appointed by the COE of the university from the panel of examiners approved by BOSR of the Department of Computer Science and Engineering, Hisar and the internal examiner is appointed by the Chairperson of the Department.

Pre-requisites:

Students are expected to have basic concepts (theoretical) of object oriented language.

The objectives of this lab.course are to:

- Learn how to input data for a given problem from keyboard and obtain outputs from monitor
- Extend the programming capability of students using object oriented language.

By the end of the course a student is expected to be able to:

- Write code for a given problem in C++.
- Present results in an informative way
- Understand the importance of concepts of object oriented approaches in software development.

Students are given ten or more laboratory assignments with soft and hard deadlines. The lab assignments are evenly spread over the semester. Every student is required to prepare a file of laboratory experiments done

List of Laboratory Assignments:

1. Write a program to find simple interest using default arguments.
2. Write a program to find area of circle using inline function.
3. Write a program to find volume of cylinder, cube and cuboid using function overloading.
4. Write a program to show static data member and static function.
5. Write a program to enter name, age and salary of 5 employees using array of objects.
6. Write a program to swap private data member of two different classes using friend function.
7. Write a program to find maximum of two numbers belonging to two different classes using friend function.
8. Write a program to add two complex numbers using constructor.
9. Write a program to show copy constructor.
10. Write a program to show destructor.
11. Write a program to show single inheritance.
12. Write a program to show multilevel inheritance.
13. Write a program to call a member function of a class using a non-member function.
14. Write a program to show overloading of binary operator.

15. Write a program to show use of this pointer.
16. Write a program using virtual functions.
17. Write a program to show concatenation of strings using operator overloading.
18. Write a program to show the use of template.
19. Write a program to read data from two files simultaneously.

PGDCA208: Seminar

General Course Information:

Course Code: PGDCA208 *Course Credits: 1 Type: Compulsory Contact Hours: 2 hours/week Mode: Lab. *In lab work one credit is equivalent to two hours	Course Assessment Methods (internal: 100) An internal examination is conducted by the assigned teacher on regular basis in lab and based evaluation is done by the teacher.

The objectives of this Seminar course are to:

- Understanding of the basics of the application of the various models of verbal and non-verbal communication in the social and professional sphere
- Develop the following skills in the students-
 - Communication Skills
 - Presentation Skills
 - Active Listening etc.

By the end of the course a student is expected to be able:

- To understanding the importance of intonation, word and sentence stress for improving communicative competence, identifying and overcoming problem sounds.
- To establish a repo with the audience.
- To present his/her ideas clearly and confidently.
- To address the queries from the audience.

General Guidelines:

- Students are required to prepare a presentation.
- The content of presentation can be on any topic other than the core subjects. However, it should be recent and relevant.
- Students are required to submit hard as well as soft copy of the presentation to the concerned teacher.

YOGA AND MENTAL HEALTH
(One Year Diploma)
[YMH]
SYLLABUS

(Implemented from academic session 2019-20)



Department of Physiotherapy
Faculty of Medical Sciences
Guru Jambheshwar University of Science and Technology,
Hisar-125 001

SCHEME OF EXAMINATION FOR YOGA AND MENTAL HEALTH
(YMH)

STUDY (CREDIT BASED SEMESTER SYSTEM)

(Implemented from academic session 2019-20)

SEMESTER I										
S. No.	Course No.	Subject	Title	Teaching hrs/Week		Marks				Total Marks
				L-T-P	Credits	Theory		Practical		
						Internal	External	Internal	External	
1	YMH 101	Fundamentals of Yoga	PC	6-0-0	6	30	70	----	----	100
2	YMH 102	Principles of Hatha Yoga	PC	6-0-0	6	30	70	----	----	100
3	YMH 103	Human Biology	PC	6-0-0	6	30	70	----	----	100
4	YMH 104	Mental Health	PC	6-0-0	6	30	70	----	----	100
5	YMH 151	Practical- Yoga Skill and Prowess-I	PC	0-0-12	6	----	----	30	70	100
Total Credits					30	120	280	30	70	500

SEMESTER II

SEMESTER II										
S. No.	Course No.	Subject	Title	Teaching hrs/Week		Marks				Total Marks
				L-T-P	Credits	Theory		Practical		
						Internal	External	Internal	External	
1	YMH 201	Patanjala Yoga Sutra	PC	6-0-0	6	30	70	----	----	100
2	YMH 202	Mental Health and Yoga Philosophy	PC	6-0-0	6	30	70	----	----	100
3	YMH 203	Yoga Therapy and Counselling	PC	6-0-0	6	30	70	----	----	100
4	YMH 251	Practical- Yoga Skill & Prowess-II	PC	0-0-12	6	----	----	30	70	100
5	YMH 252	Practical- Yoga teachings, Lesson Plan and Yoga Therapy	PC	0-0-12	6	----	----	30	70	100
Total Credits					30	90	210	60	140	500

Semester-I

YMH 101- Foundation of Yoga

Course Code	Subject	Title	Teaching hrs/Week	
			L-T-P	Credits
YMH 101	Foundation of Yoga	PC	6-0-0	6

Course Assessment Methods (Total Marks: 100=External 70+ Internal 30):

Two Minor Tests each of 20 marks, class performance measured through percentage of lecture attended (4 marks). Assignment Quiz etc. (6 marks) and end semester examination is of maximum 70 marks.

Instruction for paper setting:

Nine questions are to be set by the examiner. Question No. 1 will be compulsory and based on the entire syllabus (all the four sections). It will contain 7 short answer type questions, each of two marks. Rest of the eight questions are to be given by setting two questions from each of the four sections of the syllabus. A candidate is required to attempt other four questions by selecting one from each of the four sections. All the questions including Q. No. 1 carry 14 marks. *Question paper will be set in both English and Hindi.*

Course Objectives & Course Outcomes

This course provides the preparation of student towards providing an introduction of yoga and its important streams, a brief introduction of Indian Philosophy; and a brief history and the basis different yoga.

The student will be in a position to appreciate the Yogic way of living, which they can inculcate in their life style and will be prepared to teach others the benefits of same.

Unit-I: Introduction:

- Yoga it's Meaning and Definition.
- Aim and Objectives of Yoga
- Origin, history and development of yoga.
- Relevance and scope of Yoga in modern age
- Misconceptions about yoga and their solutions.
- Difference between yogic and non-yogic system of exercises.

Unit-II: Essentials of Yoga Practices

- Disciplines and failures in Yogic Practices
- Place & Timing of Yogic practices
- Diet for Yoga Practitioner: pathya & apathya
- Obstacles in the Path of Yoga Practice
- Sequence for yogic practices

Unit-III: Types of Yoga : it's brief Introduction

- Hatha yoga
- Raja yoga
- Mantra yoga
- Laya yoga
- Karma yoga
- Gyana yoga
- Bhakti yoga

Unit-IV : Lifesketeh & contribution of eminent Yogi's and Institutes of Yoga

- Maharshi Patanjali, Gorakshanath and Swami Vivekanand
- Swami Kuvalyananda (Kevalyadham, Lonavala)
- Swami Satyanand (Bihar School of yoga)
- Swami Shivananda (Divine Life Society)
- SVYASA, MDNIY, CCRYN,

Essential Readings:

1. Vijnananand Saraswati–Yog Vijyan, Yoga Niketan Trust, Rishikesh, 1998.
2. Rajkumari Pandey-Bhartiya Yoga Paramparake Vividh Ayam, radha publication, ND, 2008
3. Swami Vivekanand - Jnan, Bhakti, Karma Yoga & Raj yoga, Advait Ashram, Culcutta 2000.
4. Kamakhya Kumar -Yoga Mahavigyan, Standard publisher, New Delhi.
5. Kalyan (Yogank)- Gita press Gorakhpur, 2002.
6. Kalyan (Yoga Tatwank)-Gita press Gorakhpur, 1991.

Semester-I

YMH 102- Principles of Hatha Yoga

(Based on Hatha Pradipika and Gheranda Samhita)

Course Code	Subject	Title	Teaching hrs/Week	
			L-T-P	Credits
YMH 102	Principles of Hatha Yoga	PC	6-0-0	6

Course Assessment Methods (Total Marks: 100=External 70+ Internal 30):

Two Minor Tests each of 20 marks, class performance measured through percentage of lecture attended (4 marks). Assignment Quiz etc. (6 marks) and end semester examination is of maximum 70 marks.

Instruction for paper setting:

Nine questions are to be set by the examiner. Question No. 1 will be compulsory and based on the entire syllabus (all the four sections). It will contain 7 short answer type questions, each of two marks. Rest of the eight questions are to be given by setting two questions from each of the four sections of the syllabus. A candidate is required to attempt other four questions by selecting one from each of the four sections. All the questions including Q. No. 1 carry 14 marks. *Question paper will be set in hindi as well as English.*

Course Objectives & Course Outcomes

The objective of teaching Hatha yoga text subject to students is to introduce and provide them with knowledge of the Yogic practices quoted in Hatha Yoga texts and their values and benefits for human being. It will also provide understanding of the prerequisites of Hatha Yoga, to introduce the principles of Hatha Yoga and essential Hatha Yoga text.

Unit-I: Hatha Pradipika-I

- Hatha yoga – Its definition & objectives.
- Origin & tradition of Hatha yoga.
- utility of hatha yoga
- Place, Environment & Season for Hatha sadhana.
- Aids & Obstructions to Hatha sadhana.
- Prohibited & conducive food in Hatha sadhana
- Asana in Hatha Pradeepika: Types, Technique, Process and Benefits
- Pranayama in Hatha Pradeepika: Types, Technique, Process and Benefits

Unit-II: Hatha Pradipika-II

- Shatkarma: Objectives, Types, Techniques, Process and Benefits
- Mudra & Bandhas: Objectives, Types, Techniques, Process and Benefits
- concept of Samadhi
- concept of nadanusandhana
- Nature of Kundalini and methods of awakening

Unit-III: Gheranda Samhita- I

- Place, Environment & Season for Hatha sadhana.
- Prohibited & conducive food in Hatha sadhana
- Introduction to saptasadhanas

- Shatkarma: Objectives, Types, Techniques, Process and Benefits
- Asana: Objectives, Types, Techniques, Process and Benefits

Unit-IV: GherandaSamhita- II

- Mudra: Objectives, Types, Techniques, Process and Benefits
- Pratyahar: Prohibited & conducive food in Hatha sadhana
- Pranayama: Objectives, Types, Techniques, Process and Benefits
- Dhyana: Objectives, Types, Techniques, Process and Benefits
- Samadhi: Objectives, Types, Techniques, Process and Benefits

Reference Books;

1. Hatha Yoga Pradeepika-Swami Satyananda Saraswati, Bihar school of Yoga, Munger
2. Hatha Pradeepika- Swami Kuvlyanand, Kevlyadham, Lonavala
3. Gherand Samhita- Swami SatyanandaSaraswati, Bihar school of Yoga, Munger
4. Gherand Samhita- Swami Digamberanand, Kevlyadham, Lonavala

Semester-I

YMH 103- Human Biology

Course Code	Subject	Title	Teaching hrs/Week	
			L-T-P	Credits
YMH 103	Human Biology	PC	6-0-0	6

Course Assessment Methods (Total Marks: 100=External 70+ internal 30):

Two Minor Tests each of 20 marks, class performance measured through percentage of lecture attended (4 marks). Assignment Quiz etc. (6 marks) and end semester examination is of maximum 70 marks.

Instruction for paper setting:

Nine questions are to be set by the examiner. Question No. 1 will be compulsory and based on the entire syllabus (all the four sections). It will contain 7 short answer type questions, each of two marks. Rest of the eight questions are to be given by setting two questions from each of the four sections of the syllabus. A candidate is required to attempt other four questions by selecting one from each of the four sections. All the questions including Q. No. 1 carry 14 marks. *Question paper will be set in English as well as Hindi.*

Course Objectives & Course Outcomes

It aims at giving inclusive knowledge of the gross structure and development of human body. Further, it will to provide a basis for enhancing the knowledge of body's structure and function. This will help students to get familiarized with the structure of the different systems in the human body.

UNIT-I: Introduction of Anatomy and Physiology

- Brief introduction of Anatomy and Physiology of Human Body.
- Introduction to cell and Tissue, types of Muscle,
- The arrangement of bones and skeleton, functions of skeleton,
- Ribs and Vertebral column and the extremities,
- Joints of the body and their types.
- Immunity: Innate immunity, Acquired immunity,
- Allergy, hypersensitivity and immune-deficiency,
- Psycho-neuro-immunology

UNIT-II: Cardiovascular System and Respiratory System

- Blood, Blood Circulation,
- Anatomy of Heart,
- Stroke Volume, Cardiac output,
- Heart rate, Factors affecting Heart rate,
- Respiratory system of human-Nose, nasal cavity, pharynx, trachea, larynx, bronchioles, lungs
- Mechanism of breathing (Expiration and inspiration)
- Transport of respiratory gases (transport of oxygen and transport of carbon dioxide)
- Pulmonary ventilation

UNIT-III: Digestive System and Excretory System

- Digestive system of human-Mouth, buccal cavity, pharynx, oesophagus, stomach, large intestine, small intestine, anus
- Associated glands-Liver, Pancreas, salivary glands, gallbladder
- Physical digestion- Mastication, swallowing, peristalsis
- Nutrients- Carbohydrates, Fats, Proteins, Minerals, Vitamins, Dietary fibre

- Metabolism: catabolism and anabolism, Balanced Diet
- Excretory system of human-Kidney, Ureter, urinary bladder, urethra
- Structure of nephron
- Mechanism of urine formation-Ultra-filtration, selective re-absorption, tubular secretion
- Diuretics and Micturition

Unit-IV:Nervous System & Endocrine System

- Introduction to nervous system and Neuron
- Classification of nerve fibres
- Central nervous system: brain(fore brain, mid brain and hind brain) and spinal cord
- Autonomic Nervous system: sympathetic and para sympathetic
- Peripheral Nervous System: spinal and cranial nerves
- Structure, location, secretion (hormone) and function of important endocrine glands:
Hypothalamus, Pituitary, Thyroid and parathyroid gland, Adrenal, The endocrine pancreas, Pineal gland

Reference Books:

1. Anatomy and physiology for nurses, Ross and Wilson
2. Anatomy and physiology for nurses- A. K. Jain
3. Manav sharer Rachana evam Kriya Vigyan, Abrar Ahmed, Sadab Alam and Asish Mahavar, Vardhaman Publishers
4. Basic Anatomy and Physiology- A. K. Jain, second edition APC publications.

Semester-I

YMH 104-MENTAL HEALTH

Course Code	Subject	Title	Teaching hrs/Week	
			L-T-P	Credits
YMH 104	MENTAL HEALTH	PC	6-0-0	6

Course Assessment Methods (Total Marks: 100=External 70+ Internal 30):

Two Minor Tests each of 20 marks, class performance measured through percentage of lecture attended (4 marks). Assignment Quiz etc. (6 marks) and end semester examination is of maximum 70 marks.

Instruction for paper setting:

Nine questions are to be set by the examiner. Question No. 1 will be compulsory and based on the entire syllabus (all the four sections). It will contain 7 short answer type questions, each of two marks. Rest of the eight questions are to be given by setting two questions from each of the four sections of the syllabus. A candidate is required to attempt other four questions by selecting one from each of the four sections. All the questions including Q. No. 1 carry 14 marks. *Question paper will be set in English as well as Hindi.*

Course Objectives & Course Outcomes

The objective is to provide a fundamental understanding of various concepts of mental health. The students will be able to understand the concept and impart the yoga teaching accordingly.

Unit- I Introduction

- Health- Meaning, Definition and Concept
- Holistic Health: physical, mental, emotional and spiritual
- Mental Health- Meaning, Definition and Concept
- Historical perspectives of Mental Health
- Importance and promotion of Mental Health
- Components of Mental Health

Unit –II Concept of Mind

- Definition of mind according to modern science and yoga;
- Concept of mind (conscious, sub-conscious, unconscious and super-conscious mind)
- Mind – Body Relation

Unit- III General Psychology

Understanding of the following process according to modern psychology and yoga psychology

- Perception,
- Learning,
- Intelligence,
- Creativity,
- Memory and
- Emotions

Unit-IV Yogic Approach to Mental Health

- Maharshi Patanjali's Approach to Mental Health
- Hatha Yogic Approach to Mental Health
- Ayurvedic Approach to Mental Health
- Geeta's Approach to Mental Health

Semester-I

YMH 151- Practical-Yoga Skill & Prowess-I

Course Code	Subject	Title	Teaching hrs/Week	
			L-T-P	Credits
YMH 151	Yoga Skill & Prowess	PC	0-0-12	6

Course Assessment Methods (Total Marks: 100=External 70+ Internal 30):

Two Minor Tests each of 20 marks, class performance measured through percentage of lecture attended (4 marks). Assignment Quiz etc. (6 marks) and end semester examination is of maximum 70 marks.

Course Objectives & Course Outcomes

The main objective of the course is to impart knowledge about the prevention of health problems by promoting positive health through Yoga practices. To understand the underlying mechanisms of yoga practices. Student will be able to understand how to strengthen the different systems using Yoga which will help them to prevent health problems and promote positive health.

Unit-I: Prayer, Sithilikarana Vyayama, Breathing Practices

Prayer

Surya Namaskara

Sithilikarana Vyayama

- Simple Jogging ---Mukha Dhauti
- Forward jogging
- Backward jogging
- Side Jogging
- Twisting
- Rotation of arms
- Forward & backward bending
- Back stretch
- Side Bending
- Neck Movement

Breathing Practices

- Hands in and out breathing
- Hand stretch Breathing
- Ankle stretch Breathing
- Dog breathing
- Rabbit breathing
- Tiger Stretch
- Tiger Breathing

Unit-II: Kriya and Meditation

- Neti: Jal Neti and Rubber Neti
- Dhauti: Vaman
- Kapalbhathi: Vatakrma and Vyut Karma
- Breath meditation, Om Meditation

Unit-III Asana

Standing Asana

- Tadaasana
- Triyaktadasna
- Katichackrasana
- Vrikshaasana
- Trikonasana
- Shankatasana
- Utkatasana
- Urdhahasttotansana

- Sirshpadanghusthasana

Sitting Asana

- Dandasana
- Vakrasana
- Ardhamatesendryasana
- Akarnadhanurasana
- Mrjariasana
- Vygrasana
- Gomukhasana
- Vajarasana

Supine Asana

- Uttanpadasana
- Ardha-Halasana
- Halasana

Prone Asana

- Salabhasana
- Makrasana

- Padhashasana

- Ardha-Ustrasana
- Sashankasana
- Supta-Vajrasana
- Padmasana
- Toloangulasana
- Utthithapadmasana
- Matsyasana

- Naukasana
- Setubandhasana
- Shavasana

- Dhanurasana
- Vipratnaukasana

Unit IV:Pranayama and Mudra Bandha

Pranayama

- Naddishodhan
- Suryabhedan'
- Chandrabhedan

- Sheetali
- Sheetkari

Mudra AndBandha

- Moolbandha
- Jalndharbandha
- Uddiyanbandha

- Ashwani Mudra
- Shambhavi Mudra
- Vipratkarni Mudra

Reference Books:

1. Asana, Mudra, Pranayama and Bandha- Swami Satyanada Saraswati, BSY, Munger
2. Light on Yoga, BKS Iyenger
3. Hatha Yoga Pradeepika, Swami Satyanada Saraswati, BSY, Munger

Semester-II

YMH 201 - Patanjala Yoga Sutra

Course Code	Subject	Title	Teaching hrs/Week	
			L-T-P	Credits
YMH 201	- Patanjala Yoga Sutra	PC	6-0-0	6

Course Assessment Methods (Total Marks: 100=External 70+ Internal 30):

Two Minor Tests each of 20 marks, class performance measured through percentage of lecture attended (4 marks). Assignment Quiz etc. (6 marks) and end semester examination is of maximum 70 marks.

Instruction for paper setting:

Nine questions are to be set by the examiner. Question No. 1 will be compulsory and based on the entire syllabus (all the four sections). It will contain 7 short answer type questions, each of two marks. Rest of the eight questions are to be given by setting two questions from each of the four sections of the syllabus. A candidate is required to attempt other four questions by selecting one from each of the four sections. All the questions including Q. No. 1 carry 14 marks. *Question paper will be set in English as well as Hindi.*

Course Objectives & Course Outcomes

The objective of teaching Patanjala Yoga Sutrās to students is to provide them with knowledge of Patanjala's contribution to the field of Yoga, well verse with the yogic principles and it's meaning mentioned in Patanjala Yoga Sutra. The students will be able to understand human's psychology as Patanjali had explained.

Unit-I: Samadhi Pada

- Introduction of Patanjali Yoga Sutra
- Definition of Yoga according to Patanjali Yoga Sutra
- Concept of Chitta & Chitta Vrittis
- Abhyasa & Vairagya as the tools
- Yoga Antaraya
- Chitta Prasadana
- Types and nature of Samadhi

Unit-II Sadhana Pada

- Kriya Yoga
- theory of Kleshas ;
- Concept of Karmashaya
- Concept of Chaturvyuhavada
- Brief Introduction to Bhairanga Yoga:
(Yama-Niyama; Asana, Pranayama, Pratyahara and their siddhi)

Unit-III: Vibhuti Pada

- Brief Introduction to Antaranga Yoga (Dharana, Dhyana and Samadhi)
- Concept of Samyama
- Parinamatraya
- Concept & kind of Vibhuti

Unit-IV Keivalya Pada

- Five means of Siddhis
- Concept of Nirman Chitta,
- Concept of karma and vasana

- viii. Dharmamegha Samadhi and its result,
- ix. VivekaKhyati Nirupanam,
- x. Kaivalya Nirvachana

Reference Books:

1. Four Chapters of Freedom, Swami Satyanadasaraswati, BYS, Munger
2. The Science of Yoga, Taimini
3. Patanjala Yoga Sutra- Geeta Press Gorakhpur
4. Patanjala Yoga Sutra- NandalalDashora

Semester-II

YMII 202 – Mental Health and Yoga Philosophy

Course Code	Subject	Title	Teaching hrs/Week	
			L-T-P	Credits
YMII 202	Mental Health and Yoga Philosophy	PC*	6-0-0	6

Course Assessment Methods (Total Marks: 100=External 70+ Internal 30):

Two Minor Tests each of 20 marks, class performance measured through percentage of lecture attended (4 marks). Assignment Quiz etc. (6 marks) and end semester examination is of maximum 70 marks.

Instruction for paper setting:

Nine questions are to be set by the examiner. Question No. 1 will be compulsory and based on the entire syllabus (all the four sections). It will contain 7 short answer type questions, each of two marks. Rest of the eight questions are to be given by setting two questions from each of the four sections of the syllabus. A candidate is required to attempt other four questions by selecting one from each of the four sections. All the questions including Q. No. 1 carry 14 marks. *Oursim paper will be set in English as well as Hindi.*

Course Objectives & Course Outcomes

The objective is to understand the aspects of mental health in texts such as Shrimad Bhagvad Geeta, Yoga Vasistha and Upanishads as basic philosophical and theoretical foundations of Yoga. The student will be able to connect aspects of mental health with yoga philosophy.

Unit-I: Introduction

- Concept of Mental Health
- Importance of mental Health
- Crisis Of Mental Health
- Characteristics of Mental Health

Unit-2: Bhagwat Geeta

- General Introduction of Bhagwat Geeta
- Concept of Mental Health in Bhagwat geeta
- Symptoms/characterstics of Mentally Healthy Person
- Gyan Yoga, Karma Yoga and Bhakti Yoga for Mental Health

Unit-3: Yoga Vasistha

- General Introduction of Yoga vasistha
- Concept of yoga
- Concept of adhis and vyadhis and Psychosomatic Ailments
- The four Dwarpaals of Freedom
- Jana saptanbhumika(Seven Stages)

Unit- 4: Upanishads

- Taittiriya Upanishad: Concept of panchakosha
- Kena Upanishad: Self and the mind, Intuitive realization of truth, Moral of yakshavyakhayan
- Katha Upanishad: Definition of yoga, Nature of Soul, Importance of self realization
- Prashna Upanishad: The six main Questions
- Mandukya Upanishad: Four Stages of Consciousness

Semester-II

YMH 203 - Yoga Therapy and Counselling

Course Code	Subject	Title	Teaching hrs/Week	
			L-T-P	Credits
YMH 203	Yoga Therapy and Counselling	PC	6-0-0	6

Course Assessment Methods (Total Marks: 100=External 70+ Internal 30):

Two Minor Tests each of 20 marks, class performance measured through percentage of lecture attended (4 marks). Assignment Quiz etc. (6 marks) and end semester examination is of maximum 70 marks.

Instruction for paper setting:

Nine questions are to be set by the examiner. Question No. 1 will be compulsory and based on the entire syllabus (all the four sections). It will contain 7 short answer type questions, each of two marks. Rest of the eight questions are to be given by setting two questions from each of the four sections of the syllabus. A candidate is required to attempt other four questions by selecting one from each of the four sections. All the questions including Q. No. 1 carry 14 marks. *Question paper will be set in English as well as Hindi.*

Course Objectives & Course Outcomes

The objective is to produce a professional who can handle a patient and administer therapy; appreciate the relative contribution of each organ system to the homeostasis. Explain the pathological aspects of disease, illustrate the physiological response and adaptations to environmental stresses, over all personality development.

Unit-I: Introduction

- Introduction to Yoga therapy (Meaning, definition and purpose) – Adhija Vyadhi concept, IAYT, Panchakosha,
- Qualities of a Yoga Therapist
- Role of Yoga in Treatment of Common Ailments
- Importance of Yoga Therapy for Mental Health
- Introduction to stress, Physiology of stress
- Psychosomatic ailments

Unit-II: Yoga Therapy for Common Ailments

Signs & symptoms, causes and Yoga Therapy for the following ailments:

- Cardiovascular : IHD, Hypertension, Peripheral Vascular Disease.
- Respiratory : Bronchial Asthma, Allergic rhinitis.
- Musculo-skeletal : Backache, Osteoarthritis, Rheumatoid arthritis.
- Digestive Disorders : Hyperacidity, Irritable Bowel Disorder, constipation.
- Endocrine : Diabetes mellitus, Thyroid disorders, Adrenal cortex disorders, Obesity
- Obstetric and gynaecological conditions : Premenstrual Syndrome, Menstrual disorders
- Neurological Disorders: headache, migraine, epilepsy,

Unit-III Psychiatric disorders

Causes, Classification, clinical features, Medical management, Yogic Management and Evidence based yoga Therapy

- Introduction to psychiatric disorders, classification – Neurosis, Psychosis
- Neurosis:

- Anxiety disorders : Generalised anxiety disorder, Panic Anxiety, Obsessive Compulsive Disorder, Post-traumatic stress disorder and Phobias
- Depression: Dysthymia, Major depression
- addiction,
- Psychosis
 - Schizophrenia,
 - Bipolar affective disorder

Unit- IV: Yoga Counselling

- Concept of counselling and Yogic Counselling
- Qualities of a counsellor
- Methods for Chitta shuddhi

Yoga techniques to be used during counselling to cope with

- Hyper sensitive mind,
- Excessive speed of mind,
- Problems of perfectionist personality,
- Hereditary and congenital problems,
- Psychological conflicts,
- Calamities/ life events (present, past , concerns about future distressing events), ageing etc

Reference Books:

1. Yoga Therapy, Swami Satyananda saraswati, BYS, Munger
2. Yoga Therapy for Common Disease, Swami karmananda, Yoga Publication trust, Minger
3. Yoga Therapy For Common Ailment Series, R. Nagarathna & H. R. Nagendra, SVYP Publications, Bangalore
4. Yoga and Mental health, R. N. Bhugal
5. Yoga Evam Mansik Swasthya, Suresh Varanwal
6. Mental Health and Hindi Psychology, Swami Akhilananda

Semester-II

YMH 251- Practical Yoga Skill & Prowess-II

Course Code	Subject	Title	Teaching hrs/Week	
			L-T-P	Credits
YMH 251	Yoga Skill & Prowess-II	PC	0-0-12	6

Course Assessment Methods (Total Marks: 100=External 70+ Internal 30):

Two Minor Tests each of 20 marks, class performance measured through percentage of lecture attended (4 marks). Assignment Quiz etc. (6 marks) and end semester examination is of maximum 70 marks.

Course Objectives & Course Outcomes

its main objective is to provide understanding of advanced yoga techniques and to impart knowledge about the prevention of health problems by promoting positive health through Yoga practices. To understand the underlying mechanisms of yoga practices.

Student will be able to understand how to strengthen the different systems using Yoga which will help them to prevent health problems and promote positive health.

Unit-I: Prayer, and Sukshma Vyayama

Suksha Vyayama By Swami Dharendra Bharamachari

Unit-II: Kriya And Meditation

- Neti: Sutra Neti
- Dhauti: Danda And Vastra
- Kapalbhathi: Sheet Karma
- Trataka
- Nauli
- Mind Sound Resonance Technique
- Soham Sadhana

Unit-III Asana

Standing Asana

- Garudasana
- Natarajasana
- Vatayanasana
- Murdhasana
- Ekpadangusthasana
- Chackrasana
- Sarvangpusthi

Sitting Asana

- Ardhamatesendryasana
- Akarnadhanurasana-li
- Purna-Ustrasana
- Purnmatseyandra
- Rajkapot
- Mayurasana
- Bakasana
- Sirsasana
- Uttankoormasana
- Kukkutasana
- Yogamudrasana

Supine Asana

- Karanpeedasana
- Sarvangasana
- Setubandhasarvangasana
- Markatasana

Prone Asana

- Bhungasana
- Kapotasana

Unit-IV:Pranayama and Mudra Bandha

Pranayama

- Bhastrika
- Bhramari
- Anulom-Vilom
- Breathing (VibhagyiPranayam)
- Ujjayi
- Udgeet
- Sectional

Mudra AndBandha

- Shambhavi Mudra
- Mahamudra
- Kakki Mudra
- Mahaveda
- Mahabandha

Including all the practices described in Semester-I.

Reference Books:

1. Asana, Mudra, Pranayama and Bandha- Swami SatyanadaSaraswati, BSY, Munger
2. Light on Yoga, BKS Iyenger
3. Hatha Yoga Pradeepika, Swami SatyanadaSaraswati, BSY, Munger

Semester-II
YMH 252- Practical-Yoga teachings, Lesson Plan and Yoga Therapy

Course Code	Subject	Title	Teaching hrs/Week	
			L-T-P	Credits
YMH 252	Yoga teachings, Lesson Plan and Yoga Therapy	PC	0-0-12	6

Course Assessment Methods (Total Marks: 100=External 70+ Internal 30):

Two Minor Tests each of 20 marks, class performance measured through percentage of lecture attended (4 marks). Assignment Quiz etc. (6 marks) and end semester examination is of maximum 70 marks.

Course Objectives & Course Outcomes

The objective is to provide practical approach to yoga teachings planning and therapy. the student will have experience of applied yoga techniques in daily life situations.

The student will be able to impart teaching affectively based on his/her experience.

I. Yoga Teaching & Lesson Plan: 20 Marks

Each student will prepare a practical record of at least ten teaching lesson plan on differenet yogic exercises (At least 5 Asanas, 1 Sudhikriya, 1 Pranayama, 1 Mudra, and 1 Bandh) and will take teaching class in accordance with the lesson plan prepared

II. Yoga Therapy: Each student will spent 4-6 hours per day for 15 days in hospitals/yoga center/health center (Govt./private) for learning the yoga treatment of various diseases and he/she will prepare a practical record of learned yoga treatment.

A. Details of preparing case study 10 Marks

1. Name of the disease
2. Sign and symptoms of the disease
3. History of disease of patient and his/her family
4. Causes of the disease
5. Yogic treatment for the disease

B. Evidence based yoga practices for following ailments 20 Marks

(Minimum of 4 Evidence based Practices)

- Generalised anxiety disorder
- Panic Anxiety,
- Obsessive Compulsive Disorder,
- Post-traumatic stress disorder
- Depression: Dysthymia, Major depression
- addiction,
- Schizophrenia,
- Bipolar affective disorder

III. Viva Voce 20 Mark

Scheme and Syllabus of Bachelor of Computer Applications (BCA)

3 YEARS PROGRAMME

**CHOICE BASED CREDIT SYSTEM
(70:30)**

(w.e.f. session 2020-21)



Department of Computer Science & Engineering
Guru Jambheshwar University of Science & Technology, Hisar

**Scheme of Examination for
Bachelor of Computer Applications (BCA)
Three-Year Programme under CBCS Scheme
w.e.f. Academic Session 2020-21**

BCA SEMESTER-I

Course Code	Course Title	Credit	Int.	Ext.	Total
BCA-PC(L)-111	Environmental Studies	4	30	70	100
BCA-PC(L)-112	Mathematical Foundation	3	30	70	100
BCA-PC(L)-113	Computer and Programming Fundamentals	3	30	70	100
BCA-PC(L)-114	PC Software	3	30	70	100
BCA-PC(L)-115	Problem Solving Through C	3	30	70	100
BCA-PC(P)-116	Problem Solving Through C Lab	2	30	70	100
BCA-PC(P)-117	PC Software Lab	2	30	70	100
Total		20	210	490	700

BCA SEMESTER –II

Course No.	Course Title	Credit	Int.	Ext.	Total
BCA-PC(L)-121	Communication Skills and Personality Development	3	30	70	100
BCA-PC(L)-122	Computer Oriented Numerical Methods	3	30	70	100
BCA-PC(L)-123	Data Structures	3	30	70	100
BCA-PC(L)-124	Operating System	3	30	70	100
BCA-PC(L)-125	Management Information System	3	30	70	100
BCA-PC(P)-126	Data Structures Lab	2	30	70	100
BCA-PC(P)-127	Operating System Lab	2	30	70	100
Total		19	210	490	700

BCA SEMESTER-III

Course No.	Course Title	Credit	Int.	Ext.	Total
BCA-PC(L)-231	Object Oriented Programming using C++	3	30	70	100
BCA-PC(L)-232	Web Designing	3	30	70	100
BCA-PC(L)-233	Digital Electronics	3	30	70	100
BCA-PC(L)-234	Introduction to Database Systems	3	30	70	100
BCA-PC(L)-235	Advanced Data Structures	3	30	70	100
BCA-PC(P)-236	Object Oriented Programming using C++ Lab	2	30	70	100
BCA-PC(P)-237	Web Designing Lab	2	30	70	100
Total		19	210	490	700

BCA SEMESTER-IV

Course No.	Course Title	Credit	Int.	Ext.	Total
BCA-PC(L)-241	Java Programming	3	30	70	100
BCA-PC(L)-242	RDBMS	3	30	70	100
BCA-PC(L)-243	Computer Architecture	3	30	70	100
BCA-PC(L)-244	Computer Networks	3	30	70	100
	Elective-I	3	30	70	100
BCA-PC(P)-246	Java Programming Lab	2	30	70	100
BCA-PC(P)-247	RDBMS Lab	2	30	70	100
Total		19	210	490	700

Paper No	Elective 1 Choice
BCA-PE(L)-241	Advanced Web Designing
BCA-PE(L)-242	Mobile Application Development
BCA-PE(L)-243	System Administration & Maintenance

BCA SEMESTER-V

Course No.	Course Title	Credit	Int.	Ext.	Total
BCA-PC(L)-351	Programming using Python	3	30	70	100
BCA-PC(L)-352	Computer Graphics	3	30	70	100
BCA-PC(L)-353	Software Engineering	3	30	70	100
BCA-PC(L)-354	Data Warehousing and Data Mining	3	30	70	100
	Elective 2	3	30	70	100
BCA-PC(P)-356	Python Programming Lab	2	30	70	100
BCA-PC(P)-357	Computer Graphics Lab	2	30	70	100
BCA-PC(P)-358	Minor Project*	2	30	70	100
Total		21	240	560	800

Paper No	List of Elective Courses(Elective 2)
BCA-PE(L)-351	Theory of Computation
BCA-PE(L)-352	Open Source Software
BCA-PE(L)-353	Cloud Computing

BCA SEMESTER-VI

Course No.	Course Title	Credit	Int.	Ext.	Total
BCA-PC(L)-361	Internet Technology	3	30	70	100
BCA-PC(L)-362	E-Commerce	3	30	70	100
BCA-PC(L)-363	Data Analytics using R	3	30	70	100
BCA-PC(L)-364	Artificial Intelligence	3	30	70	100
	Elective 3	3	30	70	100
BCA-PC(P)-365	Data Analytics using R Lab	2	30	70	100
BCA-PC(P)-366	Major Project *	5	30	70	100
Total		22	210	490	700

Paper No	List of Elective Courses(Elective 3)
BCA-PE(L)-361	Information and Cyber Security
BCA-PE(L)-362	Multimedia Technologies
BCA-PE(L)-363	Software Testing and Quality Assurance

For minor project in Vth semester students will be evaluated on the basis of the synopsis of the problem to be addressed/ implemented during the sixth semester. The major project will be evaluated based on the quality of the solution provided for the problem undertaken and the project report.

ENVIRONMENTAL STUDIES

Course Code: BCA-PC(L)-111

Course Credit: 4

Maximum Marks: 100

Minimum Passing Marks: 40

Time: 3 Hours

External: 70

Internal: 30

Note: Examiner will be required to set nine questions in all. First question will be compulsory, consisting of objective type/short answer type questions covering the entire syllabus. In addition to that eight more questions will be set, two questions from each unit. A candidate will be required to answer five questions in all, selecting one question from each unit in addition to compulsory question number one. All questions will carry equal marks.

UNIT-I

Multidisciplinary nature of environment Studies: Definition, Scope and Importance, Need for Public Awareness; Concept, Structure and Function of an ecosystem; Producer, Consumers and Decomposition, Energy Flow in the ecosystem, Ecological Succession, Food Chains, Food Webs and Ecological Pyramids; Introduction, characteristics, features, Structure and Functions of different ecosystems such as Forest Ecosystem, Grassland Ecosystem, Dessert Ecosystem, Aquatic Ecosystem (Pond, Stream, Lake, River, Ocean, Estuaries); Biodiversity: Introduction, Definition: Generic, Species and Ecosystem diversity. Bio-geographical classification of India, Ecosystem and Biodiversity services: Ecological, Economic, Social, Consumptive use, Social Ethical, aesthetic and option Values; Biodiversity at global, national and local level, India as a mega-diversity nation, Global Hot-Spot of Biodiversity. Threats to biodiversity: habitat loss, Poaching of Wildlife, Man-Wildlife Conflicts, Biological Invasions, Endangered and endemic species of India, Conservation of Biodiversity: In-Situ and Ex-situ conservation of biodiversity.

UNIT-II

Renewable and non-renewable resources, Natural Resources and associated problems, Forest resources: use and over-exploitation, Deforestation, Case studies, Timber extraction, Mining, Dams and their effects on forests and tribal people; Water resources: Use and Over Utilization of Surface and ground water, Floods, Droughts conflicts over water, Dams benefits and problems; Minerals, resources: use and exploitation, environmental effects of extracting and mineral resources: World food problems; changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity; Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources, case studies; Land resources: land as a resources, Land degradation, man induced landslides, soil erosion and desertification.

UNIT-III

Definition of Environment Pollution: Cause, effects and control measures of Air Pollution, Soil Pollution, Noise Pollution, Nuclear hazards and human health risk; Soil Waste Management: Cause, effects and control measures of urban and industrial waste: Pollution case studies; Disaster Management: Floods, Earthquake, Cyclone and Landslides; Climate Change, Global Warming, Acid Rain, Ozone Layer Depletion; Different Laws related to environment: Environment Protection Act,

Air (Prevention and Control of Pollution) Act, Water (Prevention and Control) Act, Wildlife Protection Act, Forest Conservation Act; International Agreements: Montreal & Kyoto Protocol & Nature reserves, Tribal Populations and Human Health.

UNIT-IV

Concept of Sustainability & Sustainable development, Water conservation, Rain Water Harvesting, Watersheds management, Resettlement and rehabilitation of Project affected persons; Case Studies; Environment ethics: role of Indian and other religions and cultures in environment conservation, Environment Communication and Public awareness, case studies (e.g. CNG vehicles in Delhi); Human Population growth: Impact on environment, Human health & welfare, Environmental Movements: Chipko, Silent Valley, Bishnois of Rajasthan.

Field Work: Visit to a Local area of document environmental assets- River/Forest/Grassland/Mountain; Study of Simple ecosystem-Ponds, River, Hill Slopes etc; Study of common Plants, Insects, birds; Visit to a local Polluted Site- Urban/Rural/Industrial/Agriculture.

TEXT AND REFERENCE BOOKS:

1. Dr. D. D. Mishra, Fundamental Concepts in Environmental Studies, S. Chand Publications, New Delhi, 2008.
2. ErachBharucha, Environmental Studies for Undergraduates Courses, University Granted Commission and BharatiVidyapeeth Institute of Environmental Education and Research, Pune, University Press Pvt. Ltd., 2013.
3. Dr. S.V.S. Rana, Essentials of Ecology and Environmental Sciences, PHI Learning Pvt. Ltd. Delhi, 2013.
4. Anil Kumar, Environmental Chemistry, De.Wiley Eastern Ltd, 2007.
5. T.G. Miller, Environment Science, Wadsworth Publishing Co., 2010.
6. P.D. Sharma, Ecology and Environment, Rastogi Publications, 2011.

MATHEMATICAL FOUNDATION

Course Code: BCA-PC(L)-112

Course Credit: 3

Maximum Marks: 100

Minimum Passing Marks: 40

Time: 3 Hours

External: 70

Internal: 30

Note: Examiner will be required to set nine questions in all. First question will be compulsory, consisting of objective type/short answer type questions covering the entire syllabus. In addition to that eight more questions will be set, two questions from each unit. A candidate will be required to answer five questions in all, selecting one question from each unit in addition to compulsory question number one. All questions will carry equal marks.

UNIT-I

Set, Subsets and operations on sets, Venn Diagram of Sets, Power set of a set. Equivalence relation on a set and partition of a set, Partially ordered sets. Boolean Algebra (definition and examples).

UNIT-II

Basic properties of limits, Continuous functions and classifications of discontinuities, Derivative of a function, Derivatives of Logarithmic, Exponential, Trigonometric, Inverse Trigonometrically and hyperbolic functions. Higher order derivatives.

UNIT-III

Addition and multiplication of matrices, Laws of matrix algebra, Singular and non-singular matrices, Inverse of a matrix, Rank of a matrix, Rank of the Product of two matrices, System of Linear equations i.e. $AX=0$ and $AX=B$

UNIT-IV

Characteristic equations of a square matrix, Cayley-Hamilton Theorem, Eigenvalues and eigenvectors, Eigenvalues and eigenvectors of symmetric skew symmetric, Hermitian and skew- Hermitian matrices.

TEXT AND REFERENCE BOOKS:

1. D. A. Murray, Introductory course in Differential Equations, Orient Blackswan, 1967.
2. S. L. Ross, Differential Equations, Wiley, 2007
3. Babu Ram, Discrete Mathematics, Pearson Education India, 2010.
4. Shanti Naryana, A Textbook of Matrices, S Chand & Company, 2010.

COMPUTER AND PROGRAMMING FUNDAMENTALS

Course Code: BCA-PC(L)-113

Course Credit: 3

Maximum Marks: 100

Minimum Passing Marks: 40

Time: 3 Hours

External: 70

Internal: 30

Note: Examiner will be required to set nine questions in all. First question will be compulsory, consisting of objective type/short answer type questions covering the entire syllabus. In addition to that eight more questions will be set, two questions from each unit. A candidate will be required to answer five questions in all, selecting one question from each unit in addition to compulsory question number one. All questions will carry equal marks.

UNIT-I

Computer Fundamentals: Definition, Block Diagram along with its components, characteristics and classification of computers, Applications of computer in various fields.

Memory: Concept of primary and secondary memory, RAM, ROM, types of ROM, flash memory, Secondary storage devices, Sequential and direct access devices, viz. magnetic tape, magnetic disk, CD, DVD.

UNIT-II

Computer hardware & software: I/O Devices, definition of software, relationship b/w hardware and software, types of software.

Overview of operating system: Definition, functions of operating system, concept of multiprogramming, multi-tasking, multi-threading, multi-processing, time-sharing, real time, single user & multi-user operating system.

UNIT-III

Planning the Computer Program: Concept of problem solving, Problem definition, Program design, Debugging, Types of errors in programming, Documentation.

Techniques of problem solving: Flowcharting, algorithm, pseudo code, decision table, Structured programming concepts, Programming methodologies viz. top-down and bottom-up programming.

UNIT-IV

Searching, Sorting & Merging: Linear and binary searching, Bubble, Selection and Insertion sorting.

Computer Languages: Analogy with natural language, machine language, assembly language, high-level language, compiler, interpreter, assembler, characteristics of a good programming language.

Computer Virus: Definition, Types of viruses, Characteristics of viruses, anti-virus software.

TEXT AND REFERENCE BOOKS:

1. P. K. Sinha and Priti, Computer Fundamentals, BPB, 2007.
2. R. G. Dromey, How to Solve it by Computer, PHI, 2010.
3. E. Balagurusamy, Computing Fundamentals and C Programming, Tata McGraw Hill, 2008.
4. Norton and Peter, Introduction to Computer, McGraw Hill, 2008.
5. Leon, Alexis & Leon, Mathews, Introduction to Computers, Leon Tech World, 2009

PC SOFTWARE

Course Code: BCA-PC(L)-114

Course Credit: 3

Maximum Marks: 100

Minimum Passing Marks: 40

Time: 3 Hours

External: 70

Internal: 30

Note: Examiner will be required to set nine questions in all. First question will be compulsory, consisting of objective type/short answer type questions covering the entire syllabus. In addition to that eight more questions will be set, two questions from each unit. A candidate will be required to answer five questions in all, selecting one question from each unit in addition to compulsory question number one. All questions will carry equal marks.

UNIT-I

MS Windows: Operating system- Definition and functions, basics of Windows, Basic components of windows, icons, types of icons, taskbar, activating windows, using desktop, title bar, running applications, exploring computer, managing files and folders, copying and moving files and folders. Control panel- display properties, adding and removing software and hardware, setting date and time, screen saver and appearance.

UNIT-II

Documentation using MS-Word- Introduction to Office Automation, Creating and Editing Document, Formatting Document, Auto-text, Autocorrect, Spelling and Grammar Tool, Document Dictionary, Page Formatting, Bookmark. Advance Features of MS-Word-Mail Merge, Macros, Tables, Printing, Styles, linking and embedding objects, Template.

UNIT-III

Electronic Spreadsheet using MS-Excel- Introduction to MS-Excel, Creating and Editing Worksheet, Formatting and Essential Operations, Formulas and Functions, Charts, Advance features of MS-Excel- Pivot table & Pivot Chart, Linking and Consolidation, Database Management using Excel- Sorting, Filtering, Table, Validation.

UNIT-IV

Presentation using MS- PowerPoint: Presentations, Creating, Manipulating & Enhancing Slides, Organizational Charts, Excel Charts, Word Art, Layering art objects, Animations and Sounds, Inserting Animated Pictures or Accessing through object, Inserting Recorded Sound Effects or In-Built- Sound Effect.

TEXT AND REFERENCE BOOKS:

1. Russell A. Stultz, Learn Microsoft Office, BPB Publications, 2000.
2. Courter, G Marquis, Microsoft Office 2000: Professional Edition. BPB, 1999.
3. Koers, D, Microsoft Office XP Fast and Easy. PHI, 2001.
4. Microsoft Office- Complete Reference- BPB Publications.

PROBLEM SOLVING THROUGH C

Course Code: BCA-PC(L)-115

Course Credit: 3

Maximum Marks: 100

Minimum Passing Marks: 40

Time: 3 Hours

External: 70

Internal: 30

Note: Examiner will be required to set nine questions in all. First question will be compulsory, consisting of objective type/short answer type questions covering the entire syllabus. In addition to that eight more questions will be set, two questions from each unit. A candidate will be required to answer five questions in all, selecting one question from each unit in addition to compulsory question number one. All questions will carry equal marks.

UNIT-I

Overview of C: History of C, Importance of C, Structure of a C Program.

Elements of C: C character set, identifiers and keywords, Data types, Constants and Variables, Assignment statement, Symbolic constant.

Operator & Expression: Arithmetic, relational, logical, bitwise, unary, assignment, conditional operators and special operators. Arithmetic expressions, evaluation of arithmetic expression, type casting and conversion, operator hierarchy & associativity.

UNIT-II

Decision making & looping: Decision making with IF Statement, IF-ELSE statement, Nested IF statement, ELSE-IF ladder, switch statement, goto statement, while and do-while loop, jump in loops, break, continue statement.

Functions: Definition, Prototype, Passing parameters, Recursion.

UNIT-III

Arrays in 'C': definition, types, initialization, processing an array, passing arrays to functions.

Strings & Arrays: Declaration and initialization of string, String I/O, Array of strings, String manipulation functions: String length, copy, compare, concatenate, search for a substring.

UNIT-IV

Storage classes in C: auto, extern, register and static storage class, their scope, storage, & lifetime.

Pointers: Introduction, Pointer variables, Pointer operators, Pointer assignment, Pointer conversion, Pointer arithmetic, Pointer comparison, Pointers and arrays, Pointers and functions, Pointers and strings, dynamic allocation using pointers.

TEXT AND REFERENCE BOOKS:

1. Byron S. Gottfried, Programming with C, Tata McGraw Hill, 2005.
 2. E. Balagurusamy, Programming in ANSI C, 4th Edition, Tata McGraw Hill, 2010.
 3. Yashwant Kanetker, Let Us C, BPB, 16th Edition, 2017
 4. V. Rajaraman, Computer Programming in C, PHI, 1994
- Yashwant Kanetker, Working with C, BPB, 2003

PROBLEM SOLVING THROUGH C LAB

Course Code: BCA-PC(P)-116

Course Credit: 2

Maximum Marks: 100

Minimum Passing Marks: 40

Time: 3 Hours

External: 70

Internal: 30

Note: An internal practical examination is conducted by the course coordinator. The end semester practical examination is conducted jointly by external and internal examiners.

Students are given eight to ten laboratory assignments based on BCA-PC(L)-115. The lab assignments are evenly spread over the semester. Every student is required to prepare a file of laboratory experiments done.

PC SOFTWARE LAB

Course Code: BCA-PC(P)-117

Course Credit: 2

Maximum Marks: 100

Minimum Passing Marks: 40

Time: 3 Hours

External: 70

Internal: 30

Note: An internal practical examination is conducted by the course coordinator. The end semester practical examination is conducted jointly by external and internal examiners.

Students are given eight to ten laboratory assignments based on BCA-PC(L)-114. The lab assignments are evenly spread over the semester. Every student is required to prepare a file of laboratory experiments done.

SEMESTER 2

COMMUNICATION SKILLS AND PERSONALITY DEVELOPMENT

Course Code: BCA-PC(L)-121

Course Credit: 3

Maximum Marks: 100

Minimum Passing Marks: 40

Time: 3 Hours

External: 70

Internal: 30

Note: Examiner will be required to set nine questions in all. First question will be compulsory, consisting of objective type/short answer type questions covering the entire syllabus. In addition to that eight more questions will be set, two questions from each unit. A candidate will be required to answer five questions in all, selecting one question from each unit in addition to compulsory question number one. All questions will carry equal marks.

UNIT-I

Personality: Definition, Elements, Determinants.

Personal Grooming: Personal Hygiene, Social Effectiveness, Business Etiquettes (Power Dressing).

UNIT-II

Body Language: Non-Verbal Communication, Types of Body Language, Functions of Body Language, Role of Body Language, Proxemics.

Art of Good Communication: Verbal & Non-Verbal Communication, Difference between Oral and Written Communication, 7' Cs of Effective Communication, Importance of Effective Communication.

UNIT-III

Team: Team Behaviour, Types of Teams, Team Roles and Behaviour.

Group Discussion: Do's and Don't.

UNIT-IV

Interview Preparation: Introduction, Resume Writing, Dress Code, Mock- Interview, How to be successful in an Interview.

TEXT AND REFERENCE BOOKS:

1. C. S. Venkata Ratanam and B. K. Srivastava, Personal management and Human Resources, Tata McGraw Hill Publishing Ltd. New Delhi, 2005.
2. Keith Davis, Human Behaviour at Work, Tata McGraw Hill Publishing Ltd. New Delhi, 1975.
3. Thomas A. Harris, I m OK, You re OK, Pan Books, London and Sydney, 1973.
4. Ranjana Salgaocar, Pleasure of your Company, Pyramid Publishers, Goa, 1995.
5. Arun Agarwal, How to get the job you want, Vision Books, New Delhi, 1997.
6. Rohit Anand and Sanjeev Bikhchandani, Get That Job, Harper Collins, 1996.

COMPUTER ORIENTED NUMERICAL METHODS

Course Code: BCA-PC(L)-122

Course Credit: 3

Maximum Marks: 100

Minimum Passing Marks: 40

Time: 3 Hours

External:70

Internal:30

Note: Examiner will be required to set nine questions in all. First question will be compulsory, consisting of objective type/short answer type questions covering the entire syllabus. In addition to that eight more questions will be set, two questions from each unit. A candidate will be required to answer five questions in all, selecting one question from each unit in addition to compulsory question number one. All questions will carry equal marks.

UNIT-I

Computer Arithmetic: Floating point representation of numbers, Arithmetic Operations with normalized floating- point numbers and their consequences, significant figure.

Error in Number Representation: inherent error, truncation, absolute, related, percentage and round off errors.

Iterative Methods: Bisection, False position, Newton-Raphson method. Iteration method, discussion of convergence.

UNIT-II

Solution of Simultaneous Linear Equations & Ordinary Differential Equations: Gauss Elimination method, pivoting, Ill-conditioned equation, refinement of solutions. Gauss-Seidel iterative method, Euler method, Euler modified method, Taylor-series method, Runge-Kutta methods, Predictor-Corrector methods.

UNIT-III

Interpolation and Approximation:

Polynomial Interpolation: Newton, Lagranges, Difference tables, Approximation of functions by Taylor Series.

UNIT-IV

Numerical Differentiation and Integration: Differentiation formula based on polynomial fit, pitfalls in differentiation, Trapezoidal & Simpson Rules, Gaussian Quadrature.

TEXT AND REFERENCE BOOKS:

1. V. Rajaraman, Computer Oriented Numerical Methods, Prentice Hall, India, 1993.
2. S.S. Sastry, Introductory Methods of Numerical Analysis, 2012.
3. H.C. Saxena, Finite Differences and Numerical Analysis, 2010.
4. Modes A, Numerical Analysis for Computer Science.
5. M. K. Jain, S. R. K. Iyengar and R. K. Jain, Numerical Methods for Scientific and Engineering Computation, New Age International Publication, 2007.

DATA STRUCTURE

Course Code: BCA-PC(L)-123

Course Credit: 3

Maximum Marks: 100

Minimum Passing Marks: 40

Time: 3 Hours

External:70

Internal:30

Note: Examiner will be required to set nine questions in all. First question will be compulsory, consisting of objective type/short answer type questions covering the entire syllabus. In addition to that eight more questions will be set, two questions from each unit. A candidate will be required to answer five questions in all, selecting one question from each unit in addition to compulsory question number one. All questions will carry equal marks.

UNIT-I

Introduction: Elementary data organization, Data Structure definition, Data type vs. Data structure, Categories of data structure, Data structure operations, Applications of data structure, Algorithms complexity and time-space trade-off, Big-O notation.

UNIT-II

Strings: Introduction, Storing strings, String operations.

Array: Introduction, Linear Arrays, Representation of linear array in memory, Traversal, Insertion, Deletion in an array, Multi-dimensional arrays.

UNIT-III

Linked List: Introduction, Array vs. Linked List, Representation of Linked lists in memory, Traversal, Insertion, Deletion and Searching in a Linked List, Header Linked List, Circular Linked List, Two-Way Linked List, Applications of Linked Lists.

Stack: Introduction, Array and Linked representation of stack, operations on stack, Applications of stack: Polish Notation, Recursion.

UNIT-IV

Stack: Introduction, Array and linked representation of stacks, Operations on stacks, Applications of Stacks: Polish Notation, Recursion.

Queue: Introduction, Array and linked representation of Queue, Operations on Queues, Dequeues, Priority Queues, Applications of Queues.

TEXT AND REFERENCE BOOKS:

1. Seymour Lipschutz, Data Structure, Tata McGraw Hill, 2014.
2. Horowitz, Sahni and Anderson-Freed, Fundamentals of Data Structure in C, Orient Longman, BlackSwan, 2008
3. Trembley, J.P. And Sorenson P.G., An Introduction to Data Structures with Applications, McGraw- Hill International Student Edition, New York, 1984.

4. Yedidyan Langsam, Moshe J. Augenstein and Aaron M. Tenenbaum, Data Structures using C, Prentice Hall of India Pvt. Ltd., New Delhi, 1996.
5. Mark Allen Weiss, Data structures and Algorithm Analysis in C, Addison-Wesley (An Imprint of Pearson Education), Mexico City, Prentice-Hall of India Pvt. Ltd., New Delhi, 2008.

OPERATING SYSTEM

Course Code: BCA-PC(L)-124

Course Credit: 3

Maximum Marks: 100

Minimum Passing Marks: 40

Time: 3 Hours

External:70

Internal:30

Note: Examiner will be required to set nine questions in all. First question will be compulsory, consisting of objective type/short answer type questions covering the entire syllabus. In addition to that eight more questions will be set, two questions from each unit. A candidate will be required to answer five questions in all, selecting one question from each unit in addition to compulsory question number one. All questions will carry equal marks.

UNIT-I

Introduction: Introduction to Operating System Concepts (Including Multitasking, Multiprogramming, Multi User, Multithreading etc.), Types of Operating Systems: Batch Operating System, Time-Sharing System, Distributed Operating System, Network Operating System, Real Time Operating System, Various Operating System services, architecture, System Programs and Calls.

UNIT-II

Process Management: Process Concept, Process Scheduling, Operations on Processes; CPU Scheduling, Scheduling Criteria, Scheduling Algorithms- First come First Serve(FCFS), Shortest- Job-First (SJF), Priority Scheduling, Round Robin(RR).

Deadlock: Methods for handling deadlock- Deadlock prevention, Avoidance & Detection.

UNIT-III

Memory Management: Logical & Physical Address Space, Swapping, Contiguous Memory allocation, non-contiguous memory allocation paging and segmentation techniques; Virtual Memory Management- Demand Paging & Page Replacement Algorithm; Demand Segmentation.

UNIT-IV

File System: Different types of files and their access methods, directory structures, various allocation methods, disk scheduling and management and its associated algorithms.

TEXT AND REFERENCE BOOKS:

1. Silberschatz et al, Operating System Concepts, 5th Edition, Addison-Wesley, 1998.
2. A. Tanenbaum, Modern Operating System, Prentice Hall, 1992.
3. Peterson, Operating System, AW, 1985.
4. Milankovik, Operating System, THM, 1990.
5. Colin Ritche, Operating System Incorporating with Unix & Windows, THM, 1974.

MANAGEMENT INFORMATION SYSTEM

Course Code: BCA-PC(L)-125

Course Credit: 3

Maximum Marks: 100

Minimum Passing Marks: 40

Time: 3 Hours

External:70

Internal:30

Note: Examiner will be required to set nine questions in all. First question will be compulsory, consisting of objective type/short answer type questions covering the entire syllabus. In addition to that eight more questions will be set, two questions from each unit. A candidate will be required to answer five questions in all, selecting one question from each unit in addition to compulsory question number one. All questions will carry equal marks.

UNIT-I

Introduction to System and Basic System Concepts, Types of Systems, The Systems Approach, Information System: Definition & Characteristics, Types of information, Role of Information in Decision-Making.

UNIT-II

An overview of Management Information System: Definition & Characteristics, Components of MIS, Framework for Understanding MIS: Information requirements & Levels of Management, Simon's Model of decision-Making, Structured Vs Unstructured decisions, Formal vs. Informal Systems.

UNIT-III

Developing Information Systems: Analysis & Design of Information Systems, Implementation & Evaluation, Pitfalls in MIS Development.

UNIT-IV

Functional MIS: A Study of Personnel, Financial and Production MIS, Introduction to E-Business Systems, E-Commerce- Technologies, Applications, Decision Support Systems- Support Systems for Planning, Control and Decision- Making.

TEXT AND REFERENCE BOOKS:

1. J. Kanter, Management/Information Systems, PHI, 1983.
2. Gordon B. Davis, M. H. Olson, Management Information Systems- Conceptual Foundations, Structure and Development, McGraw Hill, 1985.
3. James A. O'brien, Management Information Systems, Tata McGraw Hill, 2006.
4. Lucas, Analysis, Design & Implementation, McGraw Hill
5. James A. Senn, Analysis, Design of Information Systems, Second Edition, McGraw Hill, 1984

DATA STRUCTURES LAB

Course Code: BCA-PC(P)-126

Course Credit: 2

Maximum Marks: 100

Minimum Passing Marks: 40

Time: 3 Hours

External: 70

Internal: 30

Note: An internal practical examination is conducted by the course coordinator. The end semester practical examination is conducted jointly by external and internal examiners.

Students are given eight to ten laboratory assignments based on BCA-PC(L)-123. The lab assignments are evenly spread over the semester. Every student is required to prepare a file of laboratory experiments done.

OPERATING SYSTEM LAB

Course Code: BCA-PC(P)-127

Course Credit: 2

Maximum Marks: 100

Minimum Passing Marks: 40

Time: 3 Hours

External: 70

Internal: 30

Note: An internal practical examination is conducted by the course coordinator. The end semester practical examination is conducted jointly by external and internal examiners.

Students are given eight to ten laboratory assignments based on BCA-PC(L)-124. The lab assignments are evenly spread over the semester. Every student is required to prepare a file of laboratory experiments done.

SEMESTER 3

OBJECT ORIENTED PROGRAMMING USING C++

Course Code: BCA-PC(L)-231

Course Credit: 3

Maximum Marks: 100

Minimum Pass marks: 40

Time: 3 hours

External: 70

Internal: 30

Note: Examiner will be required to set Nine Questions in all. First Question will be compulsory, consisting of objective type/short-answer type questions covering the entire syllabus. In addition to that eight more questions will be set, two questions from each Unit. A candidate will be required to answer five questions in all, selecting one question from each unit in addition to compulsory Question No. 1. All questions will carry equal marks.

UNIT- I

Introduction to C++, C++ Standard Library, Basics of a Typical C++ Environment, Header Files and Namespaces, Library files. Introduction to Objects and Object Oriented Programming, Encapsulation, Access Modifiers; Controlling access to a class, method or variable (public, private, protected, package), Other Modifiers, Polymorphism; overloading, Inheritance, Overriding Methods, Abstract classes, Reusability.

UNIT- II

Classes and Data Abstraction: Introduction, Structure Definitions, Accessing Members of Structure, Class Scope and Accessing Class Members, Initializing Class Objects, Constructor, Using Default Arguments with Constructor, Using Destructor, Classes: Const(Constant) Object and Const Member Function, Object as Member of Classes, Friend Function and Friend class, Function Overloading.

Operator Overloading: Introduction, Fundamentals of Operator Overloading, Restrictions on Operator Overloading, Operator Functions as Class Members vs. as Friend Function, Overloading, <<,>> Overloading Unary Operators, Overloading Binary Operators.

UNIT- III

Inheritance: Introduction, Inheritance: Base Classes and Derived Classes, Protected Members, Casting Base-Class Pointers to Derived-Class Pointer, Using Member Functions, Overriding Base-class members in a Derived class, Public, Protected, and Private Inheritance, Using Constructors and Destructors in Derived Classes, Implicit Derived-Class Object to Base-Class Object Conversion.

UNIT- IV

Virtual Functions and Polymorphism: Introduction to Virtual Functions, Abstract Base Classes and Concrete Classes, Polymorphism, New Classes and Dynamic Binding, Virtual Destructor, Polymorphism, Dynamic Binding.

File and I/O Streams: Files and Streams, Creating a Sequential Access File, Reading Data From A Sequential Access File, Updating Sequential Access File, Random Access File, Creating A Random

Access File, Writing Data Randomly to a Random Access File, Reading Data Sequential from a Random Access File.

TEXT AND REFERENCE BOOKS:

1. H. M Deitel and P.J Deitel, C++ How to Program, Prentice Hall, 1998.
2. Robert Lafore, Object Oriented Programming in Turbo C++, Galgotia Publications Pvt. Ltd., 1994.
3. D. Raichandan, Programming with C++, T.M.H, 2003.
4. Balagurusamy, Object Oriented Programming with C++ , Tata McGraw-Hill, 2001.

WEB DESIGNING

Course Code: BCA-PC(L)-232

Course Credit: 3

Maximum Marks: 100

Minimum Passing Marks: 40

Time: 3 Hours

External: 70

Internal: 30

Note: Examiner will be required to set nine questions in all. First question will be compulsory, consisting of objective type/short answer type questions covering the entire syllabus. In addition to that eight more questions will be set, two questions from each unit. A candidate will be required to answer five questions in all, selecting one question from each unit in addition to compulsory question number one. All questions will carry equal marks.

UNIT- I

Introduction to Internet and World Wide Web; Evolution and History of Word Wide Web; Basic features; Web Browsers; Web servers; Hypertext Transfer Protocol; URLs; Searching and Web-Casting Techniques; Search Engines and Search Tools;

UNIT- II

Web Publishing; Hosting your Site; Internet Services provider; Planning and designing your Web Site; Steps for developing Your site; Choosing the contents; Home page; Domain Names;

UNIT- III

Web Development: Introduction to HTML; Hypertext and HTML; HTML Document Features; HTML command Tags; Creating Links; Headers; Text styles; Text Structuring; Text colors and Background; Formatting text; Page layouts;

UNIT- IV

Images; Ordered and Unordered lists; Inserting Graphics; Table Creation and Layouts; Frame Creation and layouts; Working with Forms and menus; Working with Radio buttons; Checks Boxes; Text Boxes;

TEXT AND REFERENCE BOOKS:

1. Raj Kamal, Internet and Web Technologies, Tata McGraw- Hill, 2002.
2. Ramesh Bangia, Multimedia and Web Technologies, Firewall Media, 2007
3. Thomas A. Powell, Web Design: The complete Reference, 4/e, Tata McGraw- Hill, 2003.
4. Wendy Willard, HTML Beginners Guide, Tata McGraw- Hill, 2009.
5. Deitel and Goldberg, Internet and World Wide Web, How to Program, PHI, 2004.

DIGITAL ELECTRONICS

Course Code: BCA-PC(L)-233

Course Credit: 3

Maximum Marks: 100

Minimum Passing Marks: 40

Time: 3 Hours

External: 70

Internal: 30

Note: Examiner will be required to set nine questions in all. First question will be compulsory, consisting of objective type/short answer type questions covering the entire syllabus. In addition to that eight more questions will be set, two questions from each unit. A candidate will be required to answer five questions in all, selecting one question from each unit in addition to compulsory question number one. All questions will carry equal marks.

UNIT- I

Information Representation: Number Systems, Binary Arithmetic Operations, Fixed-point and Floating point representation of numbers, BCD Codes, Error detecting and correcting codes, Character Representation – ASCII, EBCDIC, Unicode, Binary Logic: Boolean Algebra, Boolean Theorems, Boolean Functions Truth Tables, Canonical and Standard forms of Boolean functions, Simplification of Boolean Functions - Venn Diagram, Karnaugh Maps,

UNIT- II

Digital Logic: Basic Gates -AND, OR, NOT, Universal Gates - NAND, NOR, Other Gates - XOR, XNOR etc. NAND, NOR, AND-OR-INVERT and OR-AND-INVERT implementations of digital circuits, Combinational Logic – Characteristics, Design Procedures, analysis procedures, Multilevel NAND and NOR circuits.

UNIT- III

Combinational Circuits: Half-Adder, Full-Adder, Half-Subtractor, Full-Subtractor, Encoders, Decoders, Multiplexers, Demultiplexers, Comparators, Code Converters BCD to Seven Segment Decoder.

UNIT- IV

Sequential Logic: Characteristics, Flip-Flops, Clocked RS, D type, JK, T type and Master Slave flip-flops. State table, State diagram and State equations. Flip-flop excitation tables.

TEXT AND REFERENCE BOOKS:

1. M. Morris Mano, Digital Logic and Computer Design, Prentice Hall of India Pvt. Ltd., 2004.
2. V. Rajaraman and T. Radhakrishnan, An Introduction to Digital Computer Design, Prentice Hall of India Pvt. Ltd., 2004
3. Andrew S. Tanenbaum, Structured Computer Organization, Prentice Hall of India Pvt. Ltd., 1984.
4. Nicholas Carter, Schaum's Outlines Computer Architecture, Tata McGraw-Hill., 2002.

INTRODUCTION TO DATABASE SYSTEMS

Course Code: BCA-PC(L)-234

Course Credit: 3

Maximum Marks: 100

Minimum Passing Marks: 40

Time: 3 Hours

External: 70

Internal: 30

Note: Examiner will be required to set nine questions in all. First question will be compulsory, consisting of objective type/short answer type questions covering the entire syllabus. In addition to that eight more questions will be set, two questions from each unit. A candidate will be required to answer five questions in all, selecting one question from each unit in addition to compulsory question number one. All questions will carry equal marks.

UNIT- I

Basic Concepts- Data, Information, Records and Files. Traditional file –based System- File based Approach-Limitations of File based Approach, Database Approach- Characteristics of File based Approach, Database Management System(DBMS), Components of DBMS Environment, DBMS Functions and Components, Advantages and Disadvantages of DBMS.

UNIT- II

Roles In the Database Environment – Data and Database Administrator, Database Designers, Applications Developers and Users. Database System Architecture – Three Levels of Architecture, External, Conceptual and Internal Levels, Schemas, Mappings and Instances. Data Independence – Logical and Physical data Independence.

UNIT- III

Classification of Database Management System, centralized and Client Server Architecture to DBMS. Data Models: Records-based data Models, Object-based Data models, Physical Data Models and Conceptual Modeling.

UNIT- IV

Entity-Relationship model – Entity Types, Entity Sets, Attributes relationship Types, Relationship Instances and ER Diagrams. Basic Concepts of Hierarchical and Network Data Model.

TEXT AND REFERENCE BOOKS:

1. Elmasri and Navathe, Fundamentals of Database System, 5th Edition, Pearson Education, 2006.
2. Thomas Connolly, Carolyn Begg., and Carolyn E. Begg., DS: A practical Approach to Design, Implementation and Management, 3rd Edition, Pearson Education, 2002.
3. C.J. Date, An Introduction to Database System, 8th Edition, Addison Wesley N.Delhi, 2003.

ADVANCED DATA STRUCTURES

Course Code: BCA-PC(L)-235

Course Credit: 3

Maximum Marks: 100

Minimum Passing Marks: 40

Time: 3 Hours

External:70

Internal:30

Note: Examiner will be required to set nine questions in all. First question will be compulsory, consisting of objective type/short answer type questions covering the entire syllabus. In addition to that eight more questions will be set, two questions from each unit. A candidate will be required to answer five questions in all, selecting one question from each unit in addition to compulsory question number one. All questions will carry equal marks.

UNIT-I

Tree: Introduction, Definition, Representing Binary tree in memory, Traversing binary trees, Traversal algorithm using stacks, Header nodes, Threads, Binary search trees- Searching, Insertion and Deletion.

UNIT-II

AVL search trees: Introduction, Insertion and Deletion, m-way search tree: searching, insertion and deletion, B-tree: Insertion and deletion. Hashing: Introduction, Collision resolution.

UNIT-III

Graphs: Introduction, Graph theory terminology, Sequential and linked representation of graphs, Warshall's algorithm for shortest path, Dijkstra algorithm for shortest path, Operations on graphs, Traversal of graph.

UNIT-IV

Sorting: Internal & external sorting, Radix sort, Quick sort, Heap sort, Merge sort, Comparison of various sorting and searching algorithms on the basis of their complexity.

TEXT AND REFERENCE BOOKS:

1. Seymour Lipschutz, Data Structure, Tata McGraw Hill, 2014.
2. Horowitz, Sahni and Anderson-Freed, Fundamentals of Data Structure in C, Orient Longman, BlackSwan, 2008
3. Trembley, J.P. And Sorenson P.G., An Introduction to Data Structures with Applications, McGraw- Hill International Student Edition, New York, 1984.
4. Yedidyan Langsam, Moshe J. Augenstein and Aaron M. Tenenbaum, Data Structures using C, Prentice Hall of India Pvt. Ltd., New Delhi, 1996.

OBJECT ORIENTED PROGRAMMING USING C++ LAB

Course Code: BCA-PC(P)-236

Course Credit: 2

Maximum Marks: 100

Minimum Passing Marks: 40

Time: 3 Hours

External: 70

Internal: 30

Note: An internal practical examination is conducted by the course coordinator. The end semester practical examination is conducted jointly by external and internal examiners.

Students are given eight to ten laboratory assignments based on BCA-PC(L)-231. The lab assignments are evenly spread over the semester. Every student is required to prepare a file of laboratory experiments done.

WEB DESIGNING LAB

Course Code: BCA-PC(P)-237

Course Credit: 2

Maximum Marks: 100

Minimum Passing Marks: 40

Time: 3 Hours

External: 70

Internal: 30

Note: An internal practical examination is conducted by the course coordinator. The end semester practical examination is conducted jointly by external and internal examiners.

Students are given eight to ten laboratory assignments based on BCA-PC(L)-232. The lab assignments are evenly spread over the semester. Every student is required to prepare a file of laboratory experiments done.

SEMESTER 4

JAVA PROGRAMMING

Course Code: BCA-PC(L)-241

Course Credit: 3

Maximum Marks: 100

Minimum Passing Marks: 40

Time: 3 Hours

External: 70

Internal: 30

Note: Examiner will be required to set nine questions in all. First question will be compulsory, consisting of objective type/short answer type questions covering the entire syllabus. In addition to that eight more questions will be set, two questions from each unit. A candidate will be required to answer five questions in all, selecting one question from each unit in addition to compulsory question number one. All questions will carry equal marks.

UNIT-I

Introduction to JAVA & Principles of Object Oriented Programming: Basic Concepts of OOPs and its Benefits; Applications of OOPs; The Creation of JAVA; Importance of JAVA for the Internet; JAVA's Magic: The Byte-code; Features of Java.

Data Type, Array & Strings: Data types & Operators available in JAVA; Control Structures: if, while, do while, for, switch; Break & Continue Statement;

Array and Strings: Arrays, Arrays of Characters, String handling Using String Class; Operations of String Handling; String Buffer Class.

UNIT-II

Object Oriented: Object Oriented Programming in JAVA, JAVA Program Structure. Defining of a Class, Definition of Methods, Constructors, Creating Objects of a Class, Assigning Object Reference Variables, The keyword "this", Defining and Using a Class, Automatic Garbage Collection. Extending Class and Inheritance: Using Existing Classes, Classes Inheritance, Choosing Base Class, Access Attributes, Polymorphism, Multiple Levels of Inheritance, Abstraction through Abstract Classes, Using Final Modifier, the Universal Super class-Object Class.

UNIT-III

Package & Exception Handling: Understanding Packages, Defining Package, Packaging up your Classes, Adding Classes from a Package to your Program, Understanding CLASSPATH, Standard Packages, Access Protection in Package.

Exception Handling: The Idea behind Exceptions, Types of Exceptions, Dealing with Exceptions, Exception Objects, Defining your own Exception, Checked and Unchecked Exceptions.

UNIT-IV

Creating Applets in JAVA: Applet basics, Applets architecture, Applets life cycle, simple Applet display methods; requesting repainting; using the status window; the html applet tag; passing parameters to applets.

Multithreading Programming: The JAVA Thread Model, Understanding Threads, The Main Thread, Creating a Thread: extending Thread and implementing Runnable Interface, Creating

multiple Threads, Threads Priorities, Synchronization, Deadlocks Inter-thread Communication, Deadlocks.

Input/Output in JAVA : I/O Basics, Byte and Character Structure, I/O classes, Reading Console Input, Writing to Console, Reading and Writing on Files, Random Access Files, Storing and Retrieving Objects from File, Stream Benefits.

TEXT AND REFERENCE BOOKS:

1. E. Balagurusamy, Programming with JAVA, Tata McGraw Hill, 2014.
2. Herbert Schildt, The Complete Reference JAVA, TMH Publication, 2017.
3. Ivor Horton, Beginning JAVA, WROX Public, 2005.
4. JAVA 2 UNLEASHED, Tech Media Publications / **Jamie Jaworski, Java 2 Platform Unleashed, SAMS, 1999.**
5. Patrick Naughton and Herbertz Schildt, Java-2 The Complete Reference, TMH, 1999.

RDBMS

Course Code: BCA-PC(L)-242

Course Credit: 3

Maximum Marks: 100

Minimum Passing Marks: 40

Time: 3 Hours

External: 70

Internal: 30

Note: Examiner will be required to set nine questions in all. First question will be compulsory, consisting of objective type/short answer type questions covering the entire syllabus. In addition to that eight more questions will be set, two questions from each unit. A candidate will be required to answer five questions in all, selecting one question from each unit in addition to compulsory question number one. All questions will carry equal marks.

UNIT - I

Relational Model concepts, Codd's Rules for Relational Model, Relational Algebra:- Selection and Projection, Set Operation, Renaming, Join and Division. Relational calculus: Tuple Relational Calculus and Domain Relational Calculus.

UNIT-II

Functional Dependencies and Normalization: Purpose, Data Redundancy and Update Anomalies. Functional Dependencies: Full Functional Dependencies and Transitive Functional Dependencies, Characteristics of Functional Dependencies. Decomposition and Normal Forms (1NF, 2NF, 3NF & BCNF)

UNIT – III

SQL: Data Definition and data types, Specifying Constraints in SQL, Schema, change statement, Basic Queries in SQL, Insert, Delete and Update Statement, Views.

UNIT - IV

PL/SQL: Introduction Advantages of PL/SQL, The Generic PL/SQL Block: PL/SQL Exception Environment, PL/SQL Character set and Data Types, Control Structure in PL/SQL.

TEXT AND REFERENCE BOOKS:

1. Elmasri and Navathe, Fundamentals of Database systems, 5th Edition, Pearson Education, 2006.
2. Ivan Bayross, SQL, PL/SQL-The Program Language of ORACLE, BPB Publication, 2010.
3. H. Korth, A. Silberschatz and S. Sudarshan, Database System Concept, 4th Edition, McGraw Hill International Edition, 2001.
4. C.J.Date, An Introduction to Databases Systems, 8th Edition, Addison Wesley, New Delhi, 2003.

COMPUTER ARCHITECTURE

Course Code: BCA-PC(L)-243

Course Credit: 3

Maximum Marks: 100

Minimum Passing Marks: 40

Time: 3 Hours

External: 70

Internal: 30

Note: Examiner will be required to set nine questions in all. First question will be compulsory, consisting of objective type/short answer type questions covering the entire syllabus. In addition to that eight more questions will be set, two questions from each unit. A candidate will be required to answer five questions in all, selecting one question from each unit in addition to compulsory question number one. All questions will carry equal marks.

UNIT – I

Architecture Unit: Main sub-units: Memory data register, accumulator, multiplier quotient register, adder and logic processor, shift counter, status flip-flops. Arithmetic operations – addition and subtraction, shifting, data transfer, multiplication, division, logic operations, storing.

Innovations in Arithmetic Unit: Speed of addition: addition without carries, carry storage adders, carry anticipation, the carry look ahead scheme.

UNIT – II

Memory Systems: Speed imbalance between the arithmetic and memory units, advantages of memory hierarchies, memory interleaving, problems of management of memory hierarchies, operation of virtual memories. Associative memories. Cache memories – operation of the cache, comparison of cache and virtual memory system, schemes for cache organization, word or block replacement, writing into the cache, multi level caches.

UNIT - III

General Organization and Control: Addressing schemes – one, two and three address schemes, no-address scheme, address modification and index registers, general purpose registers, addressing modes, stack organization, use of stack for evaluation of expressions, interrupt processing, subroutine return, storing local variables, storing parameters, implementation of stacks, stack organized processors. Register Transfer Language.

UNIT – IV

I/O Units: Early I/O devices, dot-matrix printers, inkjet printers, laser printers. Information exchange between devices – serial and parallel modes of transfer, synchronous and asynchronous modes of transfer–source-initiated, destination-initiated asynchronous data transfer, handshaking. Buffered I/O, Internal buffering. DMA & transfer modes. Data Channel organization, I/O bus, external interface, device controller and internal interface, processor and memory interfaces, ways of connecting devices on a bus, PCI.

TEXT AND REFERENCE BOOKS:

1. P.V.S. Rao, ComputerSystem Architecture, PHI, 2009.
2. John D. Carpinelli, Computer System Organization and Architecture, Pearson, 2009.
3. M. Morris Mano, Computer Architecture”, 3rd Edition, PHI, 2001.

4. John P. Hayes, Computer Architecture and Organization, McGraw-Hill, 1998.
5. W. Stallings, Computer Organization & Architecture, Pearson Education, 2006.

COMPUTER NETWORKS

Course Code: BCA-PC(L)-244

Course Credit: 3

Maximum Marks: 100

Minimum Passing Marks: 40

Time: 3 Hours

External: 70

Internal: 30

Note: Examiner will be required to set nine questions in all. First question will be compulsory, consisting of objective type/short answer type questions covering the entire syllabus. In addition to that eight more questions will be set, two questions from each unit. A candidate will be required to answer five questions in all, selecting one question from each unit in addition to compulsory question number one. All questions will carry equal marks.

UNIT – I

Introduction to Computer Communications and Networking Technologies, Uses of Computer Networks, Network Devices, Nodes, and Hosts, Types of Computer Networks and their Topologies; Network Software: Network Design issues and Protocols; Connection-Oriented and Connectionless Services; Network Applications and Application Protocols; Computer Communications and Networking Models: Decentralized and Centralized Systems, Distributed Systems, Client/Server Model; Network Architecture and the OSI Reference Model, Example Network: The Internet, X.25, Frame relay;

UNIT – II

Analog and Digital Communications Concepts: Representing Data as Analog Signals, Representing Data as Digital Signals, Data Rate and Bandwidth, Capacity, Baud Rate; Digital Carrier Systems; Guided and Wireless Transmission Media; Communication Satellites; Switching and Multiplexing; Dial Up Networking; Analog Modem Concepts; DSL Service

UNIT - III

Data Link Layer: Framing, Flow Control, Error Control, Error Detection and Correction, Sliding Window Protocols, Media Access Control, Random Access Protocols, Token Passing Protocols, Token Ring, Introduction to LAN technologies: Ethernet, switched Ethernet, VLAN, Fast Ethernet, gigabit Ethernet, token ring, FDDI, Wireless LANs; Bluetooth;

UNIT – IV

Network Hardware Components: Connectors, Transceivers, Repeaters, Hubs, Network Interface Cards and PC Cards, Bridge, Switches, Routers, Gateways;
Routing Concepts: Virtual Circuits and Datagrams, Routing Algorithms, Flooding, Shortest Path Routing, Distance Vector Routing, Link State Routing, Hierarchical Routing, Congestion Control Algorithms, Internetworking;

TEXT AND REFERENCE BOOKS:

1. Michael A. Gallo and William M. Hancock, Computer Communications and Networking Technologies, Course Technology, 2001.
2. Andrew S. Tanenbaum, Computer Networks, 5th Edition, Pearson Education, 2013.

3. James F. Kurose, Keith W. Ross, Computer Networking, Pearson Education, 2013.
4. Behrouz A Forouzan, Data Communications and Networking, McGraw Hill, 2017.

ADVANCED WEB DESIGNING

Course Code: BCA-PE(L)-241

Course Credit: 3

Maximum Marks: 100

Minimum Passing Marks: 40

Time: 3 Hours

External: 70

Internal: 30

Note: Examiner will be required to set nine questions in all. First question will be compulsory, consisting of objective type/short answer type questions covering the entire syllabus. In addition to that eight more questions will be set, two questions from each unit. A candidate will be required to answer five questions in all, selecting one question from each unit in addition to compulsory question number one. All questions will carry equal marks.

UNIT - I

Brief Introduction to Interactivity tools: CGI; Features of Java; Java Script; Features of ASP; VBScript; Macromedia Flash; Macromedia Dreamweaver; PHP

UNIT - II

Introduction and Features of Adobe Photoshop; Microsoft FrontPage Introduction; Features; Title Bar, Menu bar, Front Page Toolbar, Style, Front Face and Formatting Bar; Scroll Bars

UNIT - III

Introduction to DHTML and its features; Events; Cascading Style Sheets, Creating Style Sheets; Common Tasks with CSS: Text, Font, Margins, Links, Tables, Colors; Marquee; Mouseovers; Filters and Transitions; Adding Links; Adding Tables; Adding Forms; Adding Image and Sound

UNIT - IV

Extensible Mark-up Language(XML): Introduction, Features, XML Support and Usage, Structure of XML Documents, Structures in XML, Creating Document Type Declarations, Flow Objects, Working with Text and Font, Color and Background properties.

TEXT AND REFERENCE BOOKS:

1. Raj Kamal, Internet and Web Technologies, Tata McGraw-Hill, 2002.
2. Ramesh Bangia, Multimedia and Web Technology, Firewall Media, 2011.
3. DOAEC, Internet and Web Design, ITLESL Research and Development Wing, Macmillan India.
4. Thomas A. Powell, Web Design: The Complete Reference, 4 Edition, Tata McGraw-Hill, 2003.
5. H. M. Deitel, P. Deitel and A. B. Goldberg, Internet and World Wide Web, How to Program, PHI, 2004.

MOBILE APPLICATION DEVELOPMENT

Course Code: BCA-PE(L)-242

Course Credit: 3

Maximum Marks: 100

Minimum Passing Marks: 40

Time: 3 Hours

External: 70

Internal: 30

Note: Examiner will be required to set nine questions in all. First question will be compulsory, consisting of objective type/short answer type questions covering the entire syllabus. In addition to that eight more questions will be set, two questions from each unit. A candidate will be required to answer five questions in all, selecting one question from each unit in addition to compulsory question number one. All questions will carry equal marks.

UNIT – I

Getting started with Mobility: Mobility landscape, mobile platform, mobile apps development, overview of android platform, setting up the mobile app development environment along with an emulator, a case study on mobile app development.

UNIT – II

Building blocks of mobile apps: Apps user: Interface designing-mobile UI resources (Layout, UI elements, Draw-able, Menu), activity-states and life-cycle, interaction amongst activities. app-functionality beyond user interface- threads, async task, service –state and life cycle, notification, broadcast receivers, telephony and smsapis native data handling- on device file I/O, shared preferences, mobile database such as SQLite, and enterprise data access (via Internet/Intranet)

UNIT - III

Sprucing up mobile apps: Graphics and animation- custom views, canvas, animation APIs, multimedia-audio/video playback and record, location awareness, and native hardware access (sensor such as accelerometer and gyroscope).

UNIT – IV

Testing mobile apps: Debugging mobile apps, white box testing, black box testing, and test automation of mobile app, JUnit for Android, Robotium, Monkey Talk. Taking apps to market: Versioning signing and packaging mobile apps, distributing apps on mobile marketplace.

TEXT AND REFERENCE BOOKS:

1. Barry Burd, Android Application Development All in One for Dummies, John Wiley & Sons Inc., Edition I , 2011.
2. Anubhav Pradhan and Anil V Deshpandya, Mobile App Development, Edition I.

SYSTEM ADMINISTRATION AND MAINTENANCE

Course Code: BCA-PE(L)-243

Course Credit: 3

Maximum Marks: 100

Minimum Passing Marks: 40

Time: 3 Hours

External: 70

Internal: 30

Note: Examiner will be required to set nine questions in all. First question will be compulsory, consisting of objective type/short answer type questions covering the entire syllabus. In addition to that eight more questions will be set, two questions from each unit. A candidate will be required to answer five questions in all, selecting one question from each unit in addition to compulsory question number one. All questions will carry equal marks.

UNIT-I

Exploring different Operating Systems: Introduction to Linux/Unix based operating systems, introduction to Windows based operating systems, difference between Linux/Unix and other operating systems, introduction to server based operating systems, difference between desktop based (Windows 10) and server based operating systems like Windows server 2003/2008.

UNIT-II

Linux/Ubuntu System Environment: Configuring desktop environment and desktop settings, installing and configuring software and hardware, exploring file structure, terminal, shell, basic Unix Commands like cat, ls, cd, date, cal, man, echo, pwd, mkdir, rm, rmdirps, kill etc.

UNIT-III

Windows System Environment: Configuring desktop environment and desktop settings, installing and configuring software and hardware, explore system configuration using control panel, creating users, add/ delete users, difference between workgroup and domain, concept of user profiles – creating and roaming, concept of Active Directory, process and disk management, Windows task manager, exploring file structure and file properties, backup and recovery.

UNIT-IV

Network Administration: Examine network settings using commands like ipconfig/ifconfig, hostname, net, netstat, whoami etc., troubleshoot network connectivity issues using commands like: ipconfig, ping, tracert, route etc., sharing resources (files, printers etc.) on the network, accessing a system remotely using remote desktop.

TEXT AND REFERENCE BOOKS:

1. W. Panek and T. Wentworth, Mastering Windows 7 administration, Wiley Publishing Inc., 2010.
2. G. Snyder, T. R. Hein, and B. W. EviNemeth, UNIX and Linux System Administration Handbook, 5th Edition, Pearson, 2018.
3. M. S. Sobell, A Practical Guide to Ubuntu Linux, 4th Edition, Prentice Hall, 2014.
4. M. Burges, Principles of Network and System Administration. John Wiley & sons Ltd., 2003.

5. T.A. Limoncelli, C. Hogan and S. R. Chalup, The Practice of System and Network Administration, Addison-Wesley, 2007.

JAVA PROGRAMMING LAB

Course Code: BCA-PC(P)-246

Course Credit: 2

Maximum Marks: 100

Minimum Passing Marks: 40

Time: 3 Hours

External: 70

Internal: 30

Note: An internal practical examination is conducted by the course coordinator. The end semester practical examination is conducted jointly by external and internal examiners.

Students are given eight to ten laboratory assignments based on BCA-PC(L)-241. The lab assignments are evenly spread over the semester. Every student is required to prepare a file of laboratory experiments done.

RDBMS LAB

Course Code: BCA-PC(P)-247

Course Credit: 2

Maximum Marks: 100

Minimum Passing Marks: 40

Time: 3 Hours

External: 70

Internal: 30

Note: An internal practical examination is conducted by the course coordinator. The end semester practical examination is conducted jointly by external and internal examiners.

Students are given eight to ten laboratory assignments based on BCA-PC(L)-242. The lab assignments are evenly spread over the semester. Every student is required to prepare a file of laboratory experiments done.

SEMESTER 5

PROGRAMMING USING PYTHON

Course Code: BCA-PC(L)-351

Course Credit: 3

Maximum Marks: 100

Minimum Passing Marks: 40

Time: 3 Hours

External: 70

Internal: 30

Note: Examiner will be required to set nine questions in all. First question will be compulsory, consisting of objective type/short answer type questions covering the entire syllabus. In addition to that eight more questions will be set, two questions from each unit. A candidate will be required to answer five questions in all, selecting one question from each unit in addition to compulsory question number one. All questions will carry equal marks.

UNIT - I

Introduction to Python: History and Features of Python Programming, Python Interpreter. Variable, identifiers and literal. Token, keywords. Data Types. Arithmetic operators, Relational operators, Logical operators, Bitwise operators, Assignment operators, Membership operators, Identity operators. Operator precedence. Comment, Indentation, Need for indentation

Built-in Functions: input, eval, composition, print, type, round, min and max, pow. Type Conversion, Random Number Generation. Mathematical Functions. Getting help on a function, Assert Statement.

UNIT - II

Control Statements: if Conditional Statement, for and while Statements. break, continue and pass statements. Functions: Function Definition and Call, Function Arguments-Variable Function Arguments, Default Arguments, Keyword Arguments, Arbitrary Arguments. Command Line Arguments. Global and local Variables. Accessing local variables outside the scope, Using Global and Local variables in same code, Using Global variable and Local variable with same Name.

UNIT - III

Strings: String as a compound data type. String operations- Concatenation, Repetition, Membership operation, Slicing operation. String methods-count, find, rfind, capitalize, title, lower, upper, swapcase, islower, isupper, istitle, replace, isalpha, isdigit, isalnum. String Processing examples.

Lists: List operations-multiplication, concatenation, length, indexing, slicing, min, max, sum, membership operator; List functions-append, extend, remove, pop, count, index, insert, sort, reverse.

UNIT - IV

Object Oriented Programming: Introduction to Classes, Method, Class object, Instance object, Method object. Class as abstract data type, Data Class. Access attributes using functions-getattr, setattr, delattr. Built-In Class Attributes of Class object (__dict__, __doc__, __name__, module__).

TEXT AND REFERENCE BOOKS:

1. Sheetal Taneja and Naveen Kumar, Python Programming A modular Approach, Pearson, 2017.
2. ReemaThareja, Python Programming Using Problem Solving Approach, Oxford Publications.
3. Y. Daniel Liang, Introduction to Programming Using Python, Pearson, 2013.

4. Ashok Namdev Kamthane, Programming and Problem Solving with Python, Mc Graw Hill Education Publication, 2018.

COMPUTER GRAPHICS

Course Code: BCA-PC(L)-352

Course Credit: 3

Maximum Marks: 100

Minimum Passing Marks: 40

Time: 3 Hours

External: 70

Internal: 30

Note: Examiner will be required to set nine questions in all. First question will be compulsory, consisting of objective type/short answer type questions covering the entire syllabus. In addition to that eight more questions will be set, two questions from each unit. A candidate will be required to answer five questions in all, selecting one question from each unit in addition to compulsory question number one. All questions will carry equal marks.

UNIT-I

Graphics Primitives: Introduction to computer graphics, Basics of Graphics systems, Application areas of Computer Graphics, overview of graphics systems, video-display devices, and raster-scan systems, random scan systems, graphics monitors and workstations and input devices.

Output Primitives: Points and lines, line drawing algorithms, mid-point circle and ellipse algorithms. Filled area primitives: Scan line polygon fill algorithm, boundary fill and floodfill algorithms .

UNIT-II

2-D Geometrical Transforms: Translation, scaling, rotation, reflection and shear transformations, matrix representations and homogeneous coordinates, composite transforms, transformations between coordinate systems.

2-D Viewing: The viewing pipeline, viewing coordinate reference frame, window to viewport coordinate transformation, viewing functions, Cohen-Sutherland and Cyrus-beck line clipping algorithms, Sutherland –Hodgeman polygon clipping algorithm.

UNIT-III

3-D Object Representation: Polygon surfaces, quadric surfaces, spline representation, Hermite curve, Bezier curve and B-Spline curves, Bezier and B-Spline surfaces. Basic illumination models, polygon-rendering methods.

UNIT-IV

3-D Geometric Transformations: Translation, rotation, scaling, reflection and shear transformations, composite transformations.

3-D Viewing: Viewing pipeline, viewing coordinates, view volume and general projection transforms and clipping.

SUGGESTED READINGS

1. Donald Hearn and M. Pauline Baker, Computer Graphics, PHI Publications, 1997.
2. Plastock, Theory & Problem of Computer Gaphics, Schaum Series, 1986.
3. Foley and Van Dam, Fundamentals of Interactive Computer Graphics, Addison-Wesley, 1982.

4. M. W. Newman, Principles of Interactive Computer Graphics, McGraw Hill, 2016.
5. L.K. Tosijasu, Computer Graphics, Springer-Verleg.

SOFTWARE ENGINEERING

Course Code: BCA-PC(L)-353

Course Credit: 3

Maximum Marks: 100

Minimum Passing Marks: 40

Time: 3 Hours

External: 70

Internal: 30

Note: Examiner will be required to set nine questions in all. First question will be compulsory, consisting of objective type/short answer type questions covering the entire syllabus. In addition to that eight more questions will be set, two questions from each unit. A candidate will be required to answer five questions in all, selecting one question from each unit in addition to compulsory question number one. All questions will carry equal marks.

UNIT- I

Software Crisis – problem and causes, Software life cycle models: Waterfall, Prototype, Evolutionary and Spiral models. Software Project Planning: Cost estimation: COCOMO model, Project scheduling, project monitoring.

UNIT- II

Software Requirement Analysis and Specifications: Structured Analysis, Data Flow Diagram, Data Dictionaries, Software Requirement and Specifications, Behavioral and non-behavioral requirements. Software Design: Design fundamentals, problem partitioning and abstraction, design methodology, Cohesion & Coupling, Classification of Cohesiveness & Coupling.

UNIT- III

Software Configuration Management, Quality Assurance, Risk Management, Software Maintenance: Type of maintenance, Management of maintenance..

UNIT- IV

Coding: Programming style, structured programming. Software testing: Testing fundamentals, Functional testing: Boundary Value Analysis, Equivalence class testing, Decision table testing, Cause effect graphing, Software testing strategies: Unit testing, integration testing, validation testing, System testing, Alpha and Beta testing.

TEXT AND REFERENCE BOOKS:

1. R.S. Pressman, Software Engineering- A Practitioner's Approach, Tata McGraw- Hill, 2014.
2. K.K. Aggarwal and Yogesh Singh, Software Engineering, New Age Pub, 2008.
3. P. Jalote, An Integrated approach to Software Engineering, Narosa, 2005.
4. Sommerville, Software Engineering, Addison Wesley, 2006.
5. R. Fairley, Software Engineering Concepts, Tata McGraw- Hill, 1997.
6. James Peter, W Pedrycz, Software Engineering, John Wiley & Sons, 2000.

DATA WAREHOUSING AND DATA MINING

Course Code: BCA-PC(L)-354

Course Credit: 3

Maximum Marks: 100

Minimum Passing Marks: 40

Time: 3 Hours

External: 70

Internal: 30

Note: Examiner will be required to set nine questions in all. First question will be compulsory, consisting of objective type/short answer type questions covering the entire syllabus. In addition to that eight more questions will be set, two questions from each unit. A candidate will be required to answer five questions in all, selecting one question from each unit in addition to compulsory question number one. All questions will carry equal marks.

Unit I

Data Mining: Introduction, Kind of data to be mined, Data Mining Functionalities, Technologies used in Data Mining, Applications of data Mining, Major Issues in Data Mining.

Unit II

Data Pre-Processing: Introduction, Need of preprocessing, Data Objects and Attribute type, Statistical description of data, Data Visualization, Measuring similarity and dissimilarity of data, Data Cleaning, Data Integration, Data Reduction, Data Transformation and Data Discretization

Unit III

Data Warehouse: Introduction, Data Warehouse and Database Systems, Data Warehouse Architecture, Data Warehouse Models, Data Cube and OLAP, Multidimensional data Model, Concept Hierarchies, OLAP operations, Data Warehouse Implementation

Unit IV

Mining Frequent Patterns, Associations and Correlations: Introduction, Frequent Itemset Mining using Apriori Algorithm, Generating Association Rule from Frequent Itemsets. Improving efficiency of Apriori, Pattern Growth Approach for Mining Frequent Itemsets, Pattern evaluation Methods.

TEXT AND REFERENCE BOOKS:

1. Jiawei Han, MichelineKamber and Jian Pei, Data Mining Concepts and Techniques, 3rd Edition, Morgan Kaufmann Publishers, July 2011
2. AlexBerson And Stephen J. Smith, Data Warehousing, Data Mining & Olap, TataMcgraw – Hill Edition, 2004.
3. Michael Steinbach and Vipin Kumar, Introduction To Data Mining, Pang-Ning Tan, Pearson Education, 2014.
4. K.P. Soman, Shyam Diwakar and V. Ajay, Insight Into Data Mining Theory And Practice, Easter Economy Edition, Prentice Hall Of India, 2009.
5. G. K. Gupta, Introduction To Data Mining With Case Studies, Easter Economy Edition, Prentice Hall Of India, 2006.

6. Daniel T. Larose, Data Mining Methods And Models, Wiley, 2006.
7. W.H. Inmon, Building The Data Warehouse, 4th Edition, Wiley India,2005.

THEORY OF COMPUTATION

Course Code:BCA-PE(L)-351

Course Credit: 3

Maximum Marks: 100

Minimum Passing Marks: 40

Time: 3 Hours

External: 70

Internal: 30

Note: Examiner will be required to set nine questions in all. First question will be compulsory, consisting of objective type/short answer type questions covering the entire syllabus. In addition to that eight more questions will be set, two questions from each unit. A candidate will be required to answer five questions in all, selecting one question from each unit in addition to compulsory question number one. All questions will carry equal marks.

UNIT-I

Finite Automata and Regular Expressions: Definition and Description of Finite Automaton , Non-Deterministic finite automata (NFA), Deterministic finite automata (DFA), Equivalence of DFA and NFA, Finite automata with E-moves, Regular Expressions, Equivalence of finite automata and Regular Expressions, Regular expression conversion and vice versa

UNIT-II

Introduction to Machines: Concept of basic Machine, Properties and limitations of FSM. Moore and mealy Machines, Equivalence of Moore and Mealy machines, Conversion of NFA to DFA by Arden's Method.

Properties of Regular Sets: The Pumping Lemma for Regular Sets, Applications of the pumping lemma, Closure properties of regular sets, Minimization of finite Automata

UNIT-III

Grammars: Definition, Language generated by a Grammar, Chomsky Classification of Languages, Relation between classes of Languages, Operations on Languages

Context Free Language: Context Free Grammar, Ambiguity in Context Free Grammar, Reduced Form, Removal of Useless Symbols and Unit Production, Chomsky Normal Form

UNIT-IV

Pushdown Automata: Introduction to Pushdown Machines, Application of Pushdown Machines

Turing Machines: Deterministic and Non-Deterministic Turing Machines, Design of T.M, Halting problem of T.M.

TEXT AND REFERENCE BOOKS:

1. Introduction to automata theory, language & computations- Hopcroft & O.D.Ullman, R Mothwani, 2001, AW.

2. Theory of Computer Sc. (Automata, Languages and computation):K.L.P.Mishra & N.Chandrasekaran, 2000, PHI.
3. Introduction to Formal Languages & Automata-Peter Linz, 2001, Narosa Publ.
4. Introduction to languages and the Theory of Computation by John C. Martin 2003, T.M.H.

OPEN SOURCE SOFTWARE

Course Code: BCA-PE(L)-352

Course Credit: 3

Maximum Marks: 100

Minimum Pass marks: 40

Time: 3 hours

External: 70

Internal: 30

Note: Examiner will be required to set nine questions in all. First question will be compulsory, consisting of objective type/short answer type questions covering the entire syllabus. In addition to that eight more questions will be set, two questions from each unit. A candidate will be required to answer five questions in all, selecting one question from each unit in addition to compulsory question number one. All questions will carry equal marks.

UNIT-I

Introduction: History of Open Source Software (OSS), commercial software vs OSS, free software vs freeware, open source software examples - the GNU projects, copy right issues about open source software.

UNIT 2

The Linux operating system : Linux installation and hardware configuration – boot process - Linux loader (LILO) – Grand Unified Boot loader (GRUB), user account, accessing, starting and shutting processes, log in and log out, command line, simple commands, Unix file system, Unix files, i-node structure and file system related commands.

UNIT 3

Basic principles of copyright law, open source licensing, issues with copyright and patent, warranty, MIT license, BSD License, Apache license, Academic Free License, Mozilla Public License, GPL, LGPL. 59

UNIT 4

Study of commercial application software vs OSS, Open Office.

GIMP: Installation, GIMP user interface, creating new windows.

GIMP: Freehand drawing in GIMP, drawing regular shapes, image editing- cropping and resizing, masking.

GIMP: Language support

TEXT AND REFERENCE BOOKS:

1. A.M. Laurent, Understanding Open Source and Free Software Licensing. O'Reilly Media, 2004.
2. M. N. Rao, Fundamentals of Open Source Software, 1st Edition, PHI Learning, 2014.
3. W.E. Shotts, The Linux Command Line: A Complete Introduction, No Starch Press, 2012.
4. O. Lecarme and K. Delvare, The Book of GIMP, No Starch Press, 2013.
5. J. Smith and R. Joost, GIMP for Absolute Beginners, Apress, 2012.

CLOUD COMPUTING

Course Code: BCA-PE(L)-353

Course Credit: 3

Maximum Marks: 100

Minimum Passing Marks: 40

Time: 3 Hours

External: 70

Internal: 30

Note: Examiner will be required to set nine questions in all. First question will be compulsory, consisting of objective type/short answer type questions covering the entire syllabus. In addition to that eight more questions will be set, two questions from each unit. A candidate will be required to answer five questions in all, selecting one question from each unit in addition to compulsory question number one. All questions will carry equal marks.

UNIT -I

Cloud Computing: Introduction to client server computing, Peer to Peer computing, Distributed computing, collaborative computing and cloud computing, Importance of cloud computing in current era, Characteristics, advantages and disadvantages of cloud computing.

UNIT -II

Cloud Services: Functioning of cloud computing, Classification of cloud on the basis of services: Software as a Service (SaaS), Platform as a Service (PaaS), and Infrastructure as a Service (IaaS): Definition, characteristics and their benefits.

UNIT- III

Cloud Architecture: Cloud computing Logical and service architecture, Types of clouds: Private cloud, Public cloud and Hybrid cloud, Comparison of a Private, public and hybrid clouds, Migrating to a cloud, Seven step model to migrate.

UNIT -IV

Applications: Business opportunities using cloud, Managing Desktop and devices in cloud, cloud as a type of distributed infrastructure, Application of cloud computing for centralizing Email communication, collaboration on schedules, calendars. Overview of major cloud service providers - Amazon Ec2, Google App Engine.

TEXT AND REFERENCE BOOKS:

1. Srinivasan, A. Cloud Computing: A Practical Approach for Learning and Implementation, Pearson Education India, 2014.
2. Velte, Anthony T., Toby J. Velte, Robert C. Elsenpeter, and Robert C. Elsenpeter, Cloud computing: a practical approach, New York: McGraw-Hill, 2010.

PYTHON PROGRAMMING LAB

Course Code: BCA-PC(P)-356

Course Credit: 2

Maximum Marks: 100

Minimum Passing Marks: 40

Time: 3 Hours

External: 70

Internal: 30

Note: An internal practical examination is conducted by the course coordinator. The end semester practical examination is conducted jointly by external and internal examiners.

Students are given eight to ten laboratory assignments based on BCA-PC(L)-351. The lab assignments are evenly spread over the semester. Every student is required to prepare a file of laboratory experiments done.

COMPUTER GRAPHICS LAB

Course Code: BCA-PC(P)-357

Course Credit: 2

Maximum Marks: 100

Minimum Passing Marks: 40

Time: 3 Hours

External: 70

Internal: 30

Note: An internal practical examination is conducted by the course coordinator. The end semester practical examination is conducted jointly by external and internal examiners.

Students are given eight to ten laboratory assignments based on BCA-PC(L)-352. The lab assignments are evenly spread over the semester. Every student is required to prepare a file of laboratory experiments done.

MINOR PROJECT

Course Code: BCA-PC(P)-358

Course Credit: 2

Maximum Marks: 100

Minimum Passing Marks: 40

Time: 3 Hours

External: 70

Internal: 30

Note: An internal practical examination is conducted by the course coordinator. The end semester practical examination is conducted jointly by external and internal examiners.

Project work will be carried out under supervision of teacher of the College/Department. Evaluation & viva-voce to be done jointly by internal and external examiners.

SEMESTER 6

INTERNET TECHNOLOGY

Course Code: BCA-PC(L)-361

Course Credit: 3

Maximum Marks: 100

Minimum Pass marks: 40

Time:3 hours

External: 70

Internal: 30

Note: Examiner will be required to set Nine Questions in all. First Question will be compulsory, consisting of objective type/short-answer type questions covering the entire syllabus. In addition to that eight more questions will be set, two questions from each Unit. A candidate will be required to answer five questions in all, selecting one question from each unit in addition to compulsory Question No. 1. All questions will carry equal marks.

UNIT- I

Internet and TCP/IP: Introduction to the Internet, Internet History, Internet Administration; Internet and Intranet; Internet Service; TCP/IP Model and its protocols; IP addresses: IPv4; Subnetting, IPv4 addresses; Supernetting; Next generation Internet Protocol(IPv6); The need for IPv6; Packet Format; IPv6 Addresses; Extension Headers.

UNIT- II

TCP/IPs Transport and Network Layer Protocols: Role of TCP, UDP, IP and Port Numbers; Format of TCP, UDP and IP; TCP services; TCP connection management; Remote Procedure Call; SCTP; IP address resolution- Domain Name Space; DNS mapping; Recursive and Iterative resolution; Resource records; Mapping Internet Address to Physical Addresses; ARP, RARP, BOOTP, DHCP; ICMP; IGMP.

UNIT- III

TCP/IP Application Level Protocols; Electronic Mail: Architecture; SMTP, MIME, POP, IMAP; Web Based Mail; File Access and transfer: FTP, Anonymous FTP, TFTP, NFS; Remote login using TELNET; Voice and Video over IP: RTP, RTCP, IP Telephony and Signaling, Resource Reservation and Quality of service, RSVP.

UNIT- IV

Routing in Internet: RIP, OSPF, BGP; Internet Multicasting; Mobile IP; Private Network Interconnection: Network Address Translation(NAT), Virtual Private network(VPN); Internet Management: SNMP; Internet Security; IPSec, EMail Security; Web Security, Firewalls; Digital Signatures; Certificates.

TEXT AND REFERENCE BOOKS:

1. Douglas E. Comer, Internetworking with TCP/IP Volume-I, Principles, Protocols, and Architecture, Fourth Edition, Pearson Education, 2018.
2. Andrew S. Tanenbaum, Computer networks, Pearson Education, 2013.
3. Behrouz A Forouzan, Data Communications and Networking, McGraw Hill, 2017.
4. Michael A. Gallo and William M. Hancock, Computer Communications and Networking Technologies, Course Technology, 2001.

5. James F. Kurose and Keith W. Ross, Computer Networking, A Top-Down Approach Featuring the Internet, Pearson Education.
6. Wayne Tomasi, “Introduction to Data Communications and Networking”, Pearson Education.

E-COMMERCE

Course Code: BCA-PC(L)-362

Course Credit: 3

Maximum Marks: 100

Minimum Pass marks: 40

Time: 3 hours

External: 70

Internal: 30

Note: Examiner will be required to set Nine Questions in all. First Question will be compulsory, consisting of objective type/short-answer type questions covering the entire syllabus. In addition to that eight more questions will be set, two questions from each Unit. A candidate will be required to answer five questions in all, selecting one question from each unit in addition to compulsory Question No. 1. All questions will carry equal marks.

UNIT-I

Introduction to E-Commerce-Business operations, E-commerce practices vs. traditional business practices; concepts of b2b,b2c,c2c,b2g,g2c; Features of E-Commerce, Types of Ecommerce Systems, Elements of E-Commerce, Benefits and Limitations of E-Commerce.

UNIT-II

Concepts of EDI (Electronic Data Interchange), EDI vs. Traditional methods, Benefits of EDI, Drawbacks of EDI, Components of EDI, EDI Implementation, Applications of EDI, Financial EDI, Concept of E-Governance.

UNIT-III

Products in b2c model, e-brokers; Broker-based services on-line; Benefits and impact of e-commerce on travel industry; Online banking and its benefits; On-line financial services, E-auctions- implementations and benefits.

UNIT-IV

Electronic Payment System and its types, define E-money and E-wallets, Electronic fund transfer, Security Issues in E-commerce, Essential Security Requirements for safe Electronic Payments, Security Schemes.

TEXT AND REFERENCE BOOKS:

1. E. Turban, J. Lee, D. King and H. M Chung, Electronic commerce-a Managerial Perspective, Prentice-Hall International, Inc., 2002.
2. V. Bhatia, E-commerce, Khanna Book Pub. Co.(P) Ltd., Delhi, 2000
3. Bharat Bhasker, Electronic Commerce -Framework, technologies and Applications, TMH Publications, 2013
4. David Whitely, Electronic Commerce, TMH, N Delhi, 2000.
5. Shurety, E-business with Net Commerce, Addison Wesley Longman, 1999.
6. Kosiur, Understanding E—Commerce, Prentice Hall of India, N. Delhi

DATA VISUALIZATION USING R

Course Code: BCA-PC(L)-363

Course Credit: 3

Maximum Marks: 100

Minimum Pass marks: 40

Time: 3 hours

External: 70

Internal: 30

Note: Examiner will be required to set nine questions in all. First question will be compulsory, consisting of objective type/short answer type questions covering the entire syllabus. In addition to that eight more questions will be set, two questions from each unit. A candidate will be required to answer five questions in all, selecting one question from each unit in addition to compulsory question number one. All questions will carry equal marks.

UNIT- I

Introduction to R: Installation of R, features of R, applications of R programming, data types in R, scripting in R, data editing, use of R as a calculator, control structures in R.

UNIT- II

Data Handling in R: Importing data in R (loading Tables and CSV files), Reading and writing files in R.

UNIT- III

Basic data structures in R: Vectors, matrices, array, lists, data frames.

UNIT- IV

Visualization Tools: Introduction to simple graphics and plots, bar charts, histograms, pie charts, scatter plots (plotting multiple variables), line plots and regression, word clouds, radar charts, waffle charts, box plots, exporting plots as images.

TEXT AND REFERENCE BOOKS:

1. R. Kabacoff, R in Action: Data Analysis and Graphics with R, Manning Publications, 2011.
2. T. Rahlf, Data Visualization with R: 100 Examples. Springer, 2017.
3. J. Adler, R in a Nutshell: A Desktop Quick Reference, 2nd Edition, O'Reilly Media, 2012.
4. T. M. Davies, The book of R, 1st Edition, No Starch Press, 2016.

ARTIFICIAL INTELLIGENCE

Course Code: BCA-PC(L)-352

Course Credit: 3

Maximum Marks: 100

Minimum Passing Marks: 40

Time: 3 Hours

External: 70

Internal: 30

Note: Examiner will be required to set nine questions in all. First question will be compulsory, consisting of objective type/short answer type questions covering the entire syllabus. In addition to that eight more questions will be set, two questions from each unit. A candidate will be required to answer five questions in all, selecting one question from each unit in addition to compulsory question number one. All questions will carry equal marks.

UNIT-I

Overview of Artificial Intelligence: Introduction to AI, Importance of AI, AI and its related field, AI techniques, Problems, Problem Space and search: Defining the problem as a state space search, Production system and its characteristics, Issue in the design of search problem.

UNIT-II

Knowledge representation: Definition and importance of knowledge, Knowledge representation, various approaches used in knowledge representation, Issues in knowledge representation, Using Predicate Logic: Representing simple facts in logic.

UNIT-III

Heuristic Search Technique: Generate and test, hill climbing, Best first search technique, Problem Reduction, Constraint Satisfaction.

Natural language processing: Introduction syntactic processing, Semantic processing, Discourse and pragmatic processing.

UNIT-IV

Learning: Introduction learning, Rote learning, learning by taking advice, Learning in problem solving, learning from example-induction, Explanation based learning.

Expert system: Introduction, Representing using domain specific knowledge, Expert system shells, LISP and other AI programming languages.

TEXT AND REFERENCE BOOKS:

1. E. Rich and K. Knight, Artificial intelligence, TMH, 2nd Edition, 1999.
2. D. W. Patterson, Introduction to AI and Expert Systems, PHI, 1999.
3. Nils J Nilsson, Artificial intelligence –A new Synthesis, 2nd Edition, Harcourt Asia Ltd., 2000.

INFORMATION AND CYBER SECURITY

Course Code: BCA-PE(L)-361

Course Credit: 3

Maximum Marks: 100

Minimum Pass marks: 40

Time: 3 hours

External: 70

Internal: 30

Note: Examiner will be required to set nine questions in all. First question will be compulsory, consisting of objective type/short answer type questions covering the entire syllabus. In addition to that eight more questions will be set, two questions from each unit. A candidate will be required to answer five questions in all, selecting one question from each unit in addition to compulsory question number one. All questions will carry equal marks.

Unit I

Cryptography: Overview of Information Security, Basic Concepts, Cryptosystems, Cryptanalysis, Ciphers & Cipher modes, Symmetric Key Cryptography DES, AES. Asymmetric Key Cryptography, RSA algorithm, Diffie Hellman Algorithm. Digital Signature-Digital Signatures.

Unit II

System Security: Program Security, Malicious Logic, Protection. Database Security- Access Controls, Security & Integrity Threats, Defence Mechanisms. OS Security-Protection of System Resources.

Unit III

Ethics in Cyber Security: Privacy, Intellectual Property in cyberspace, Professional Ethics, Freedom of Speech, Fair User and Ethical Hacking, Trademarks, Internet Fraud, Electronic Evidence, forensic Technologies, Digital Evidence collections. Tools and Methods Used in Cybercrime: Introduction, Proxy Servers and Anonymizers, Phishing, Password Cracking.

Unit IV

Cybercrimes and Cybersecurity: Cybercrime and Legal Landscape around the world, Cyberlaws, The Indian IT Act, Challenges, Digital Signatures and Indian IT Act, Amendments to the Indian IT Act, Cybercrime and punishment, Cost of Cybercrimes and IPR Issues, Web threats for Organizations, Social Computing and associated Challenges for Organizations.

TEXT AND REFERENCE BOOKS:

1. Cryptography and Network security-Principles and Practices, Pearson Education, 9th Indian Reprint, 2005
2. Charlie Kaufman , Network Security : Private communication in Public World, Prentice-Hall International, Inc. April 2008
3. Nina Godhole and Sunit Belapure, Cyber Security, Wiley India, 2011.
4. James Graham and Ryan Olson, Cyber Security Essentials, Rick Howard CRC Press, Taylor & Francis, 2011.

MULTIMEDIA TECHNOLOGY

Course Code: BCA-PE(L)-362

Course Credit: 3

Maximum Marks: 100

Minimum Pass marks: 40

Time: 3 hours

External: 70

Internal: 30

Note: Examiner will be required to set Nine Questions in all. First Question will be compulsory, consisting of objective type/short-answer type questions covering the entire syllabus. In addition to that eight more questions will be set, two questions from each Unit. A candidate will be required to answer five questions in all, selecting one question from each unit in addition to compulsory Question No. 1. All questions will carry equal marks.

UNIT-I

Introduction to Multimedia: Components of Multimedia; Hypermedia and Multimedia; Overview of Multimedia Software Tools; Multimedia Hardware and Software; Basic Software Tools; Making Instant Multimedia; Presentation Tools; Multimedia Authoring; Types of Authoring Tools; Page-Based Authoring Tools; Icon-Based Authoring tools; Time-Based Authoring Tools.

UNIT-II

Graphics and Image Data Representation: Graphics/Image Data Types, Popular File Formats; Color Models in Images and Video; Types of Video Signals Analog and Digital Video; Broadcast Video Standards: NTSC, HDTV; Chroma Subsampling.

UNIT-III

Digital Audio: Digitization of Sound; MIDI Versus Digital Audio; Quantization and Transmission of audio: Coding of Audio; Pulse Code Modulation; Differential Coding of Audio; Lossless Predictive Coding; DPCM.

UNIT-IV

Multimedia Data Compression: Run-Length Coding; Variable-Length Coding; Dictionary-Based Coding; Transform Coding; Image Compression Standards-JPEG standard; Video Compression Technique: MPEG.

TEXT AND REFERENCE BOOKS:

1. Ze-Nian Li and Mark S. Drew, Fundamentals of Multimedia, Pearson Education, 2003.
2. Tay Vaughan, Multimedia Making it Work, Tata McGraw-Hill, 1999.
3. Ramesh Bangia, Multimedia and Web Technology, Firewall Media, 2007.
4. John F. Koegel Buford, Multimedia systems, Addison Wesley, Pearson Education, 1994.
5. Ana Weston Solomon, Introduction to Multimedia, Tata McGraw-Hill

SOFTWARE TESTING AND QUALITY ASSURANCE

Course Code: BCA-PE(L)-363

Course Credit: 3

Maximum Marks: 100

External: 70

Minimum Passing Marks: 40

Internal: 30

Time: 3 Hour

Note: Examiner will be required to set nine questions in all. First question will be compulsory, consisting of objective type/short answer type questions covering the entire syllabus. In addition to that eight more questions will be set, two questions from each unit. A candidate will be required to answer five questions in all, selecting one question from each unit in addition to compulsory question number one. All questions will carry equal marks.

UNIT I

Introduction: Some Terminologies, Failures, Testing Process, Limitations of Testing and V-Shaped Software Life-Cycle Model.

Functional Testing: Boundary Value Analysis, Equivalence Class Testing, Decision Table Based Testing, and Cause Effect Graphing Technique.

Structural Testing: Control Flow Testing, Data Flow Testing, Slice Based Testing and Mutation Testing.

Software Verification: Verification Methods, Software Requirement Specification Document Verification, Software Design Description Document Verification.

UNIT II

Selection, Minimization and Prioritization of Test Cases for Regression Testing: Regression Testing, regression Test Case Selection, Reducing the Number of Test Cases, Risk Analysis and Code Coverage Prioritization Techniques. Software Testing Activities Levels of Testing, Debugging, Software Testing Tools, Software Test Plan.

Object Oriented Testing: Object Orientation, Object Oriented Testing, Path Testing, State Based Testing and class testing.

Metrics in Software Testing: Software Metrics, Categories of Metrics, Object Oriented Metrics in Testing.

UNIT - III

Software Quality concepts: Meaning and scope, software quality factors, software quality metrics, relationship between quality factors and quality metrics, quality management system, Concepts of Quality Control, Quality Assurance, Quality Management - Total Quality Management; Cost of Quality; QC tools, Business Process Re-engineering - Zero Defect, Six Sigma, Quality Function Deployment, Benchmarking, Statistical process control.

Software measurement: Fundamentals of measurement, Measurements in Software Engineering, Measurement of internal product attributes - size and structure, External product attributes - measurement of quality, Software quality metrics - Software Process, Project and Product Metrics, metrics for software maintenance.

UNIT - IV

Quality assurance models: ISO-9000 Series and SEI-CMM standards of software quality assurance. People Capability Maturity Model, Capability Maturity Model Integration, Malcolm Baldrige Award, FCMM.

Software Quality Assurance related topics

Software Process - Definition and implementation; internal Auditing and Assessments; Software testing - Concepts, Tools, software reviews, formal technical reviews, Inspections & Walkthroughs; correctness proof, statistical quality assurance, clean room software engineering.

TEXT AND REFERENCE BOOKS:

1. Software Testing, Yogesh Singh, Cambridge University Press, 2012.
2. Effective Methods for Software Testing, William E. Perry, John Wiley and Sons, 2002.
3. Software Testing: Principle, Techniques and Tools, M. G. Limaye, Tata McGraw Hill, 2009.
4. Software Engineering, K. K. Aggarwal and Yogesh Singh, New Age International Publishers, Third Edition, 2008.
5. The Art of Software Testing, Glenford J. Myers, Tom Badgett and Corey Sandler, Wiley & Sons, Third Edition, 2012.
6. Metrics and Models in Software Quality Engineering, Stefan H Khan, Addison-Wesley; 2nd edition, 2014.
7. Software Quality: Theory and Management, Alan Gillies, lulu.com; Third Edition, 2011.

DATA ANALYTICS NUSING R LAB

Course Code: BCA-PC(P)-365

Course Credit: 2

Maximum Marks: 100

Minimum Passing Marks: 40

Time: 3 Hours

External: 70

Internal: 30

Note: An internal practical examination is conducted by the course coordinator. The end semester practical examination is conducted jointly by external and internal examiners.

Students are given eight to ten laboratory assignments based on BCA-PC(L)-363. The lab assignments are evenly spread over the semester. Every student is required to prepare a file of laboratory experiments done.

MAJOR PROJECT

Course Code: BCA-PC(P)-366

Course Credit: 5

Maximum Marks: 100

Minimum Passing Marks: 40

Time: 3 Hour

External: 70

Internal: 30

Note: An internal practical examination is conducted by the course coordinator. The end semester practical examination is conducted jointly by external and internal examiners.

Project work will be carried out under supervision of official / Engineer / teacher of industry/company/institute/College. Evaluation & viva-voce to be done jointly by internal and external examiners.

CHOICE BASED CREDIT SYSTEM

(CBCS)

Guru Jambheshwar University of Science and Technology, Hisar

Revised Scheme and Syllabi
for

Undergraduate Course:

B. SC. PHYSICAL SCIENCES

**(PHYSICS/GEOGRAPHY, CHEMISTRY/
ELECTRONICS/ COMPUTER SCIENCE/ COMPUTER
APPLICATIONS, MATHEMATICS)**

Under
The Faculty of Physical Sciences and Technology



w.e.f. Academic Session 2018-19

The Revised/consolidated scheme and syllabi of First Year of B.Sc. (Physical Sciences: Physics/Geography, Chemistry/Electronics/Computer Science/Computer Applications, Mathematics) as approved by the competent authority is as under:

Semester-I

Paper Code	Course opted	Nomenclature	Credits	Hr/ week	Marks		
					Ext.	Int.	Total
CXL- 101	Language Skills Compulsory Course-I	English-I	2	2	80	20	100
CPL- 102	Core Course-I (Physics)	Mechanics-I	2	2	80	20	100
CPL- 103	Core Course-II (Physics)	Electricity and Magnetism-I	2	2	80	20	100
CGL- 102	Core Course-I (Geography)	Physical Geography-I	2	2	80	20	100
CGL- 103	Core Course-II (Geography)	Physical Geography-II	2	2	80	20	100
CCL- 104	Core Course-I (Chemistry)	Inorganic Chemistry-I(Atomic structure and Bonding)	2	2	80	20	100
CCL- 105	Core Course-II (Chemistry)	Organic Chemistry-I(General Organic Chemistry and Aliphatic Hydrocarbons)	2	2	80	20	100
CEL- 104	Core Course-I (Electronics))	Network Analysis and Electronic Devices	2	2	80	20	100
CEL- 105	Core Course-II (Electronics))	Analog Electronics	2	2	80	20	100
CCsL- 104	Core Course-I (Computer Science)	Fundamentals of Computer	2	2	80	20	100
CCsL- 105	Core Course-II (Computer Science)	Programming in 'C'	2	2	80	20	100
CCaL- 104	Core Course- I (Computer Applications)	Computer Fundamentals and Operating System	2	2	80	20	100
CCaL- 105	Core Course- II (Computer Applications)	Office Automation Tools	2	2	80	20	100
CML- 106	Core Course-I (Mathematics)	Algebra	4	4	80	20	100
CML- 107	Core Course-I (Mathematics)	Calculus	4	4	80	20	100
CYL- 111	Awareness Program Compulsory Course	Environmental Studies	2	2	80	20	100
CPP- 108*	Practical-I (Physics)	Physics Lab-I	2	4	50	-	50
CGP- 108*	Practical-I (Geography)	Geography Lab-I	2	4	50	-	50
CCP- 109*	Practical-I (Chemistry)	Chemistry Lab-I	2	4	50	-	50
CEP- 109*	Practical-I (Electronics)	Electronics Lab-I (Network Analysis and Analog	2	4	50	-	50

		Electronics)					
CCsP- 109*	Practical-I (Computer Science)	Computer Lab-I (Based on Fundamentals of Computer & Programming in 'C')	2	4	50	-	50
CCaP- 109*	Practical- I (Computer Applications)	Computer Lab-I	2	4	50	-	50
CMP- 110*	Practical-I (Mathematics)	Mathematics Lab-I	1.5	3	50	-	50

- The practical examination to be conducted annually with Second semester examination.

Semester-II

Paper Code	Course opted	Nomenclature	Credits	Hr/ week	Marks		
					Ext.	Int.	Total
CXL- 201	Language Skills Compulsory Course-II	English-II	2	2	80	20	100
CPL- 202	Core Course-III (Physics)	Mechanics-II	2	2	80	20	100
CPL- 203	Core Course-IV (Physics)	Electricity, Magnetism and EMT-II	2	2	80	20	100
CGL- 202	Core Course-III (Geography)	Human Geography-I	2	2	80	20	100
CGL- 203	Core Course-IV (Geography)	Human Geography-II	2	2	80	20	100
CCL- 204	Core Course-III (Chemistry)	Physical Chemistry- I (Chemical Energetics and Equilibria)	2	2	80	20	100
CCL- 205	Core Course-IV (Chemistry)	Organic Chemistry- II (Functional Group Organic Chemistry)	2	2	80	20	100
CEL- 204	Core Course-III (Electronics)	Linear and Digital Integrated circuits	2	2	80	20	100
CEL- 205	Core Course-IV (Electronics))	Digital Electronics	2	2	80	20	100
CCsL- 204	Core Course-III (Computer Science)	Data Structure using 'C'	2	2	80	20	100
CCsL- 205	Core Course-IV (Computer Science)	Computer Organisation	2	2	80	20	100
CCaL- 204	Core Course- III (Computer Applications)	Information Technology	2	2	80	20	100
CCaL- 205	Core Course- IV (Computer Applications)	Programming in 'C'	2	2	80	20	100
CML- 206	Core Course-III (Mathematics)	Vector Calculus and Geometry	4	4	80	20	100
CML- 207	Core Course-IV (Mathematics)	Ordinary Differential Equations and Laplace Transformations	4	4	80	20	100
CPP- 208	Practical-II	Physics Lab-II	2	4	50	-	50

	(Physics)						
CGP- 208	Practical-II (Geography)	Geography Lab-II	2	4	50	-	50
CPP-209	Practical-II (Chemistry)	Chemistry Lab-II	2	4	50	-	50
CEP-209	Practical-II (Electronics)	Linear Integrated circuits and Digital Electronics Lab	2	4	50	-	50
CCsP-209	Practical-II (Computer Science)	Computer Lab-II (Based on Data Structure using 'C')	2	4	50	-	50
CCaP-209	Practical-II (Computer Applications)	Computer Lab- II	2	4	50	-	50
CMP-210	Practical-II (Mathematics)	Mathematics Lab-II	1.5	3	50	-	50

Note:

- (1) The subject combinations under B.Sc. (Physical Sciences)are :
 - (i) B.Sc. (Physical Sciences: Physics, Chemistry, Mathematics)
 - (ii) B.Sc. (Physical Sciences: Geography, Computer Science, Mathematics)
 - (iii) B.Sc. (Physical Sciences: Physics, Electronics, Mathematics)
 - (iv) B.Sc. (Physical Sciences: Physics, Computer Science, Mathematics)
 - (v) B.Sc. (Physical Sciences: Physics, Computer Applications, Mathematics)
- (2) The scheme and syllabus of Mathematics papers is also implemented to BA (with Mathematics) Courses. However, the marking scheme in case of BA courses (Mathematics Subject) will be same as decided by the concerned Board of Studies/Faculty of Humanities and Social Sciences.
- (3) For the students of B.Sc. Geography, the core papers of Physics is to be replaced by Core papers of the Geography; for Computer Science, the core papers of Chemistry is to be replaced by Core papers of the Computer Sciences; for Electronics the core papers of Chemistry is to be replaced by Core papers of the Electronics and similarly for Computer Applications, the core papers of Chemistry is to be replaced by Core papers of the Computer Applications as decided by the respective Board of studies/Faculty of Engineering and Technology.
- (4) Definition of Credit:

1 credit=1 Hr. Lecture (L) per week
 1 credit= 2 Hrs. Practical (P) per week
 2 Hrs. = 3 periods of approx. 40/45 minutes
- (5) Practical examinations (both odd and even semester's practicals of 50 marks each) to be held annually with even semesters. The marks of Odd semester practicals may be reflected in the DMC of Even semester with code and nomenclature, to be shown separately for each semester.
- (6) The distribution of internal assessment marks of 20 is based on the marks obtained by the student in one Minor test of 12 marks to be conducted preferably in the month of November for Odd Semester and in the month of April for Even Semester. A student is required to pass the individual paper with 35% marks overall including internal assessment based on minor test. He may not be given any additional chance for minor test. However, the student also needs to pass the external examination individually with 35% marks. There will be maximum 4 marks for attendance (1 mark for attendance of 71-75%, 2 marks for attendance of 76-80%, 3 marks for attendance of 81-85% and 4 marks for attendance above 85%). The remaining 4 marks are for Extracurricular activities including assignments.
- (7) The Batches of 20 or more can be opted for various courses as per requirement for all practical purposes by the college/institution. The evaluation of Practical may be distributed as 20% marks for lab record, 50% marks for performance during the examination and 30% marks for Viva Voce examination.

SEMESTER I & II
B. SC. PHYSICAL SCIENCES
LANGUAGE SKILLS COMPULSARY COURSE
(ENGLISH)

CXL-101
LANGUAGE SKILLS COMPULSARY COURSE-I
ENGLISH-I
(Credits: 02, 30 Hrs (2Hrs /week))

External Marks: 80
Internal Assessment: 20
Time Allowed: 3 Hours

Paper setter is required to set five questions in all. Question no. 1 is Compulsory and is based on the entire syllabus consisting of ten short answer type questions each of 2 marks. The remaining four questions is to be set uniformly having two questions from each part/unit of 15 marks each. The student is required to attempt five questions in all.

PART-A: The Following text is prescribed for intensive study:

Following poems from *The Chronicles of Time* edited by Asha Kadyan (Oxford University Press)

1. William Shakespeare "Let Me Not to the Marriage of True Minds"
2. John Donne "Death Be Not Proud"
3. John Milton "On His Blindness"
4. Henry Vaughan "The Retreat"
5. John Dryden "Shadwell"
6. Alexander Pope "Know Then Thyself"
7. William Blake "The Little Black Boy"
8. William Wordsworth "Three Years She Grew in Sun and Shower"
9. Percy B. Shelley "England in 1819"
10. Alfred, Lord Tennyson "Crossing the Bar"

PART-B: English Grammar and Composition

1. Translation from Hindi to English
(Comprehension based on unseen passage for foreign/non- Hindi speaking candidates)
2. Paragraph Writing
3. Common Phrasal Verbs, Prepositions & Common Errors in English

SCHEME OF QUESTION PAPER

Note: The question paper will carry a maximum of 80 marks. The paper will have five questions as per details given below.

- Q. 1. There will be ten short answer type questions (one mark each) based on the text book.
(2x10 = 20 marks)
- Q.2. (a) The candidates will be asked to explain with reference to the context an extract from the text book. There will be internal choice. (7.5 marks)
(b) The candidates will be asked to answer comprehension questions based on an extract from the text book. There will be internal choice. (7.5 marks)
- Q.3. There will be one essay type question based on the text book with internal choice.
(15 marks)
- Q.4. (a) Translation of a passage of about 10 sentences from Hindi to English
(Non-Hindi speaking/foreign candidates will attempt a question of comprehension with internal choice based on an unseen passage in lieu of this question).
(7.5 marks)
(b) Paragraph (Candidates will be required to write about 150 words on any one out of the five given topics).
(7.5 marks)
- Q.5. There will be one question with parts on the following items: common phrasal verbs, prepositions, common errors in English.
(15 marks)

CXL-201
LANGUAGE SKILLS COMPULSARY COURSE-II
ENGLISH-II
(Credits: 02, 30 Hrs (2Hrs /week))

External Marks: 80
Internal Assessment: 20
Time Allowed: 3 Hours

Paper setter is required to set five questions in all. Question no. 1 is Compulsory and is based on the entire syllabus consisting of ten short answer type questions each of 2 marks. The remaining four questions are to be set uniformly having two questions from each part/unit of 15 marks each. The student is required to attempt five questions in all.

PART-A: The following text is prescribed for intensive study:

1. Following essays from *Ideas Aglow* edited by Dinesh Kumar and V. B. Abrol
(Publication Bureau, Kurukshetra University, Kurukshetra)

1. C.E.M. Joad 'Our Civilization'
2. Jayant V. Narlikar 'It's Question Time'
3. N. Ram 'An Interview with Christiaan Barnard'
4. B.R. Ambedkar 'Untouchability and the Caste System'
5. Huck Gutman 'Inhumanisation of War'
6. Amartya Sen 'Seven Types of Gender Inequality'

PART-B: English Grammar and Composition

1. Translation from English to Hindi
(Comprehension based on unseen passage for foreign/non- Hindi speaking candidates)
2. Précis
3. Official Correspondence: Letter Writing

SCHEME OF QUESTION PAPER

Note: The question paper will carry a maximum of 80 marks. The paper will have five questions as per details given below.

Q. 1. There will be ten short answer type questions (one mark each) based on the text book.
(2x10 = 10 marks)

Q.2. (a) The candidates will be asked to explain with reference to the context an extract from the text book. There will be internal choice. (7.5 marks)

(b) The candidates will be asked to answer comprehension questions based on an extract from the text book. There will be internal choice. (7.5 marks)

There will be one essay type question based on the text book with internal choice.
(15 marks)

Q.4. (a) Translation of a passage of about 10 sentences from English to Hindi (Non-Hindi speaking/foreign candidates will attempt a question of comprehension with internal choice based on an unseen passage in lieu of this question).

(7.5 marks)

(b) Précis: The candidates will be required to summarize a given passage in Contemporary English of about 250 words to one-third of its length and also give it a suitable heading.

(7.5 marks)

The candidates will be asked to write an official letter. There will be internal choice.
(15 marks)

SEMESTER I & II
B. SC. PHYSICAL SCIENCES
(PHYSICS)

CPL-102
Core Course-I
MECHANICS-I
(Credits – 02, 30 Hrs (2 Hrs/week))

Marks for Major test (External): 80

Marks for internal Exam : 20

Time: 3 Hours

Paper setter is required to set nine questions in all. Question no. 1 is Compulsory and is based on the entire syllabus consisting of eight short answer type questions each of 2 marks. The remaining eight questions is to be set uniformly having two questions from each unit. The student is required to attempt five questions in all selecting one question from each unit and Question no. 1 is Compulsory, The paper will include at least 20% of total marks as numerical problems.

Course Objective	Course Outcome
The course on mechanics deals with some important mathematical physics concepts, Laws of Motion, Rotational motion, Gravitation, and Elasticity.	The student will be able to understand basic mathematical physics equations, motion of different objects, global positioning system, planetary motion etc.

UNIT-I

Vectors: Scalar and vector fields, Derivatives of a vector with respect to a parameter, Gradient of a scalar field and its geometrical interpretation, Divergence and curl of a vector field, Laplacian operator, Vector identities, Line, surface and volume integrals of Vector fields, Flux of a vector field, Gauss's divergence theorem, Stokes Theorem and their applications (no rigorous proofs) (Any mathematical physics book)

UNIT-II

Time derivative of vectors with examples (1.10, Ref. 1), Concepts of cartesian, polar and spherical coordinates, Motion in plane Polar Coordinates, velocity and acceleration in polar coordinates (1.11, Ref. 1), Dynamics Using Polar Coordinates (2.10, Ref. 1)

Momentum and Energy: Momentum, Conservation of momentum, Centre of mass, Centre of mass coordinates with examples (4.1 to 4.5 Ref. 1), Motion of rockets (4.8, Ref. 1), Work and energy, Conservation of energy (5.1 to 5.3, Ref. 1)

UNIT-III

Dynamics of a system of particles: Elastic and inelastic collisions between particles (6.5.2, Ref. 1), Centre of Mass and Laboratory frames (6.5.4, Ref. 1)

Rotational Motion: Angular velocity and angular momentum (7.2, Ref. 1), Moment of inertia and parallel and perpendicular axis theorem (7.3, Ref. 1), Moment of inertia of (a) thin uniform wire (b) Thin rectangular sheet (c) Rectangular slab (d) ring (e) disc (f) spherical shell (g) solid sphere (h) hollow sphere, Torque (7.4, Ref. 1), Conservation of angular momentum (7.5, Ref. 1), Angular momentum as vector (8.2, Ref. 1), Coriolis forces and its effect on motion (9.5 along with examples, Ref. 1)

UNIT-IV

Central force: Basics properties of central forces, Two body problem equivalent to one body problem and concept of reduced mass, Motion of a particle in a central force field (motion is in a plane, angular momentum is conserved, areal velocity is constant) (10.2, 10.3 Ref. 1), Kepler's Laws (10.1 along with example 7.6 of Ref. 1)

Elasticity: Hooke's law - Stress-strain diagram - Elastic moduli, Poisson's Ratio, Relation between four elastic constants (Ref. 4), Bending moments, Bending of cantilever and centrally loaded beams (Ref. 4)

Reference Books:

1. An introduction to Mechanics (2nd Ed.), D. Kleppner and R.J. Kolenkow, Cambridge Univ. Press
2. University Physics, FW Sears, MW Zemansky and HD Young 13/e, 1986. Addison-Wesley
3. Mechanics Berkeley Physics course, v.1: Charles Kittel, et. Al. 2007, Tata McGraw-Hill.
4. Mechanics, D.S. Mathur, S. Chand and Company Limited, 2000.
5. Introduction to Special Relativity, R. Resnick, 2005, John Wiley and Sons.
6. Classical Mechanics, J.C Uppadhyaya, Himalaya Publishing House

CPL-103
Core Course –II
ELECTRICITY AND MAGNETISM-I
(Credits – 02, 30 Hrs (2 Hrs/week))

Marks for Major test (External): 80

Marks for internal Exam : 20

Time: 3 Hours

Paper setter is required to set nine questions in all. Question no. 1 is Compulsory and is based on the entire syllabus consisting of eight short answer type questions each of 2 marks. The remaining eight questions is to be set uniformly having two questions from each unit. The student is required to attempt five questions in all selecting one question from each unit and Question no. 1 is Compulsory. The paper will include at least 20% of total marks as numerical problems.

Course Objective	Course Outcome
The course on Electricity and Magnetism deals with Coulomb's law, Electric field, potential formulation of electrostatic, Capacitors, Magnetism and magnetic materials along with the applications of these concepts	The student will be able to understand Gauss-divergence theorem, Stokes theorem in dielectrics, electrical and magnetic properties of materials

UNIT-I

Electrostatics: Electrostatic Field (2.1, Ref.1), Electric flux, Gauss's theorem of electrostatics, Applications of Gauss theorem (2.2, Ref.1), Divergence and curl of electrostatic field (2.2, Ref.1) and their physical significance, Electric potential, Electric potential as line integral of electric field (2.3, Ref.1), Calculation of electric field from potential, Energy stored in electrostatic field per unit volume (2.4 of ref.1)

UNIT-II

Application of Electrostatics: Laplace and Poisson's equations for the electrostatic field (2.3.3, 3.1: Ref.1), Multi-pole expansion of potential due to arbitrary charge distribution (3.4:Ref.1), Dielectric medium, Polarization (4.1:Ref.1), Bound charges in a polarized dielectric and their physical interpretation (4.2:Ref.1), Electric displacement (4.3.1:Ref.1), Gauss's theorem in dielectrics (4.3.1:Ref.1), Parallel plate capacitor completely filled with dielectric, Susceptibility, Permittivity and dielectric constants (4.4.1:Ref.1)

UNIT-III

Magnetism: Lorentz force law, Magnetic forces (5.1:Ref.1), Magnetostatics: Biot-Savart's law & its applications (1) straight conductor (2) circular coil (3) solenoid carrying current (5.2:Ref.1), Divergence and curl of magnetic field (5.3.1:Ref.1), Ampere's circuital law and its applications for simple current configurations (5.3.3:Ref.1), Magnetic vector potential (5.4.1:Ref.1).

UNIT-IV

Magnetization: The field of a magnetized object, bound currents, physical interpretation of bound currents (6.2:Ref.1), Ampere's law for magnetized objects, The Auxiliary field (H) (6.3:Ref.1), Magnetic properties of materials (6.1:Ref.1), Permeability, Magnetic susceptibility (6.4:Ref.1), diamagnetism, para-magnetism and ferromagnetism (6.1, 6.4.2:Ref.1), B-H Curve (6.4.2:Ref.1), Currie point (6.4.2:Ref.1)

Reference Books:

1. Introduction to Electrodynamics, 3rd Ed., 1998, D.J. Griffiths, Benjamin Cummings.
2. Electricity and Magnetism, Edward M. Purcell, 1986, McGraw-Hill Education.
3. Electricity and Magnetism, J.H. Fewkes & J. Yarwood. Vol. I, 1991, Oxford Univ. Press.
4. University Physics, Ronald Lane Reese, 2003, Thomson Brooks/Cole.

CPP- 108
Practical -I; Physics Lab--I
(Credits: 02, 60 Hours (4hrs. per week))

Max. Marks: 50

Time: 4 Hours

Note:-

1. Do any four experiments from each Section.
2. The students are required to calculate the error involved in a particular experiment.
3. For giving marks under Lab. Record each college will maintain practical assessment record by using the following procedure:-
Each student has to perform a minimum number of experiments prescribed in the syllabus.
After the completion of a practical the teacher concerned will check the note book and conduct the Viva – voce of each student to find out how much concepts related to the theoretical and experimental part of the experiment he/ she has understood. According to his/her performance marks will be recorded on their practical note-book. These marks will constitute the lab. Record.
4. To compute the final marks for lab. Record, a separate register will be maintained. Each student will be assigned separate page on this register. On this page the marks obtained by the student in different practicals will be entered. This record will be signed by the concerned teacher.
5. The laboratory Record register will be presented to the external practical examiners for Lab. Record marks. These external examiners may verify the record randomly.

Section: A

1. Moment of Inertia of a fly-wheel.
2. M.I. of an irregular body using a torsion pendulum.
3. Surface tension by Jeager's Method.
4. Young's Modulus by bending of beam.
5. Modulus of rigidity by Maxell's needle.

Section: B

6. E.C.E of Hydrogen using an Voltmeter
7. Determination of Impedance of an A.C. circuit and its verification.
8. Frequency of A.C. mains by Sonometer using an electromagnet.
9. Frequency of A. C. mains by Sonometer using an electric vibrator.
10. Low resistance by Carey Foster's bridge with calibration.

References:

1 Worshnop and Flint, Advanced Practical Physics

2 Nelkon M and Ogborn, Advanced Level Practical Physics, Heinemann Education Bookd Ltd, New Delhi

3 Srivastava S S and Gupta M K, Experiments in Electronics, Atma Ran & Sons, Delhi
4 Gupta S L and Kumar V, Practical Physics, Pragati Prakashan, Meerut.

CPL-202
Core Course-III
MECHANICS-II
(Credits – 02, 30 Hrs (2 Hrs/week))

Marks for Major test (External): 80

Marks for internal Exam : 20

Time: 3 Hours

Paper setter is required to set nine questions in all. Question no. 1 is Compulsory and is based on the entire syllabus consisting of eight short answer type questions each of 2 marks. The remaining eight questions is to be set uniformly having two questions from each unit. The student is required to attempt five questions in all selecting one question from each unit and Question no. 1 is Compulsory, *The paper will include at least 20% of total marks as numerical problems.*

Course Objective	Course Outcome
The course on mechanics deals with Lagrangian formulation of mechanics, Oscillatory motion and damping and special theory relativity	The student will be able to understand some advanced notion of mechanics, SHM and relativistic addition of velocities.

UNIT-I

Constrained motion, Degree of freedom and Generalized coordinates, Generalized displacement, velocity, acceleration, momentum, force and potential, Hamilton's variational principle, Lagrange's equation of motion from Hamilton's principle, Application of Lagrange's equation for simple problems of mechanics (*Ref.1*).

UNIT-II

Oscillations: Simple harmonic motion, Simple pendulum (*11.2, Ref.2*), Compound Pendulum, Differential equation of SHM and its solutions. Kinetic and Potential Energy, Total Energy and their time averages, Damped oscillations (*11.3, 11.2, Ref.2*), Forced oscillations (*11.2, 11.4, Ref.2*).

UNIT-III

Theory of Relativity: Inertial and non-inertial frame of references, Galilean transformation (velocity, acceleration) and its inadequacy (sec. 1.2 and 1.3 of Resnick), Michelson-Morley Experiment and its outcome (sec. 1.5 of Resnick), Postulates of Special Theory of Relativity (sec. 1.9 of Resnick), Lorentz Transformations (sec. 2.2 of Resnick), Length contraction, Time dilation (sec.2.3 of Resnick).

UNIT-IV

Application of Relativity: Relativistic transformation of velocity (2.6, *Ref.3*), frequency and wave number (2.7, *Ref.3*), Variation of mass with velocity (3.2, 3.3 *Ref.3*), Massless Particles, Mass-energy Equivalence (3.6, *Ref.3*), Relativistic Doppler effect (2.7, *Ref.3*), Relativistic Kinematics(3.5, *Ref.3*), Transformation of Energy and Momentum (3.7, *Ref.3*), Four Vectors (3.7, *Ref.3*)

Reference Books:

1. Classical Mechanics, 3rd Edition, Pearson
2. An introduction to Mechanics, D. Kleppner and R.J. Kolenkow, 1973, McGraw-Hill.
3. Introduction to Special Relativity, R. Resnick, 2005, John Wiley and Sons.
4. Mechanics Berkeley Physics course,v.1: Charles Kittel, et. Al. 2007, Tata McGraw-Hill.
5. University Physics, Ronald Lane Reese, 2003, Thomson Brooks/Cole.
6. Mechanics, D.S. Mathur, S. Chand and Company Limited, 2000.

CPL-203
Core Course-IV
ELECTRICITY, MAGNETISM & ELECTROMAGNETIC THEORY-II
((Credits – 02, 30 Hrs (2 Hrs/week))

Marks for Major test (External): 80

Marks for internal Exam : 20

Time: 3 Hours

Paper setter is required to set nine questions in all. Question no. 1 is Compulsory and is based on the entire syllabus consisting of eight short answer type questions each of 2 marks. The remaining eight questions is to be set uniformly having two questions from each unit. The student is required to attempt five questions in all selecting one question from each unit and Question no. 1 is Compulsory, The paper will include at least 20% of total marks as numerical problems.

Course Objective	Course Outcome
The course on Electricity and Magnetism deals with the Electromagnetic induction, Maxwell's Equations, Electromagnetic wave propagation, Poynting's Vector and electromagnetic field transformation	The student will be able to understand electromagnetic induction and its applications, Maxwell's equations and generation of electromagnetic fields, wave propagation through vacuum and isotropic dielectric medium.

UNIT-I

Electromagnetic Induction: Motional EMF (7.1.2, 7.1.3:Ref.1), Faraday's laws of electromagnetic induction (7.2:Ref.1), Self and mutual inductance (L and M respectively) (7.2.3:Ref.1, Energy stored in magnetic field (7.2.4:Ref.1).

AC Circuit Analysis: AC circuit analysis using complex variables, AC circuits with (a) R and C (b) R and L (c) R, L and C, Series and parallel resonance circuits, Quality factors and its importance

UNIT-II

Maxwell's equations: Maxwell's fixing of Ampere's law, Displacement current, Maxwell's equations in vacuum, Maxwell's equations in matter (7.3:Ref.1), The continuity equation (8.1.1:Ref.1), Poynting Theorem and Poynting vector (8.1.2:Ref.1), Momentum and angular momentum in electromagnetic field (qualitative only) (8.2.3,8.2.4:Ref.1), Energy density in electromagnetic field (8.1.2:Ref.1).

UNIT-III

The wave equation, Sinusoidal waves (9.1.1, 9.1.2, 9.1.4:Ref.1), Wave equations for $\mathbf{E}$ and $\mathbf{B}$ fields, Electromagnetic wave propagation through vacuum and isotropic dielectric medium, transverse nature of EM waves, Energy and momentum in EM waves (9.2:Ref.1), Propagation in linear media (9.3.1:Ref.1), Reflection and transmission at Normal and Oblique incidence (9.3.2,9.3.3:Ref.1), Brewster's angle (9.3.3:Ref.1)

UNIT-IV

Scalar and vector potential for electromagnetic fields (10.1.1:Ref.1), Gauge Transformation (10.1.2:Ref.1), Coulomb Gauge, Lorentz Gauge (10.1.3:Ref.1), Electric and magnetic dipole radiation (no derivation needed, discussion of results only) (11.1.1 and results and assumptions used to derive the results in section 11.1.2, 11.1.3:Ref.1), Magnetism as relativistic phenomenon (12.3.1:Ref.1or:Ref.2), Transformation of electric and magnetic fields between two inertial frames (12.3.2:Ref.1or :Ref.2).

Reference Books:

1. Introduction to Electrodynamics, 3rd Ed., 1998, D.J. Griffiths, Benjamin Cummings.
2. Electricity and Magnetism, Edward M. Purcell, 1986, McGraw-Hill Education..
3. Electricity and Magnetism, J.H. Fewkes & J. Yarwood. Vol. I, 1991, Oxford Univ. Press.
4. University Physics, Ronald Lane Reese, 2003, Thomson Brooks/Cole.

CPP 208
Practical -II; Physics Lab--II
(Credits: 02; 60 Hrs (4Hrs /week))

Marks: 50

Time: 3 Hours

Note:-

1. Do any Four experiments from each Section.
2. The students are required to calculate the error involved in a particular experiment.
3. For giving marks under Lab. Record each college will maintain practical assessment record by using the following procedure:-
Each student has to perform a minimum number of experiments prescribed in the syllabus.

After the completion of a practical the teacher concerned will check the note book and conduct the Viva – voce of each student to find out how much concepts related to the theoretical and experimental part of the experiment he/ she has understood. According to his/her performance marks will be recorded on their practical note-book. These marks will constitute the lab. Record. To compute the final marks for lab. Record, a separate register will be maintained. Each student will be assigned separate page on this register. On this page the marks obtained by the student in different practicals will be entered. This record will be signed by the concerned teacher.

4. The laboratory Record register will be presented to the external practical examiners for Lab. Record marks. These external examiners may verify the record randomly.

Section: A

1. Elastic constant by Scarle's method.
2. Viscosity of water by its flow through a uniform capillary tube.
3. 'g' by Bar pendulum..
4. Calibration of a thermocouple by Potentiometer.

Section: B

5. High resistance by substitution method.
6. To draw forward and reverse bias characteristics of a semiconductor diode.
7. Zener Diode voltage regulation characteristics.
8. Verification of inverse square law by photo-cell.
9. To study the characteristics of a solar cell.

References:

1 Worshnop and Flint, Advanced Practical Physics

2 Nelkon M and Ogborn, Advanced Level Practical Physics, Heinemann Education Bookd Ltd, New Delhi

3 Srivastava S S and Gupta M K, Experiments in Electronics, Atma Ran & Sons, Delhi 4
Gupta S L and Kumar V, Practical Physics, Pragati Prakashan, Meerut.

SEMESTER I & II
B. SC. PHYSICAL SCIENCES
(GEOGRAPHY)

CGL- 102
Core Course-I
PHYSICAL GEOGRAPHY-I
(Credits: 02, 30 Hrs (2Hrs /week))

Marks for Major Test (External): 80

Marks for Internal Exam: 20

Time: 3 Hours

Paper setter is required to set nine questions in all. Question no. 1 is compulsory and is based on the entire syllabus consisting of eight to ten short answer type questions each of 2 marks. The remaining eight questions are to be set uniformly having two questions from each unit. The student is required to attempt five questions in all selecting one question from each unit and Question No. 1 is compulsory.

Unit-I

Physical Geography: Definition, Nature & Scope.

Origin of the Earth: Tidal and Big Bang Theory

Unit-II

Internal Structure of Earth

(Based on Seismic Evidences)

The Rocks: Classification of Rocks and associated features

Unit-III

Endogenetic and Exogenetic processes

Plate Tectonics: Meaning & Types of Plates, Motion & Associated features

Unit-IV

Agents of Denudation: Wind, River and underground water

Cycle of Erosion: Davis and Penck

CGL- 103
Core Course-II
PHYSICAL GEOGRAPHY-II
(Credits: 02, 30 Hrs (2Hrs /week))

Marks for Major Test (External): 80

Marks for Internal Exam: 20

Time: 3 Hours

Paper setter is required to set nine questions in all. Question no. 1 is compulsory and is based on the entire syllabus consisting of eight to ten short answer type questions each of 2 marks. The remaining eight questions are to be set uniformly having two questions from each unit. The student is required to attempt five questions in all selecting one question from each unit and Question No. 1 is compulsory.

Unit-I

Atmosphere: Composition and Structure
Insolation and Temperature
Global Air Circulation Pattern: Permanent, Periodic and Local winds

Unit-II

Monsoon and Theories of its origin
Fronts and Cyclones (Temperate and Tropical)

Unit-III

Hydrological Cycle
Ocean Floor Relief Features

Unit-Iv

Ocean Water temperature and Salinity
Ocean water Circulation: Tides and Currents

Reading List

1. Conserva H. T., 2004: Illustrated Dictionary of Physical Geography, Author House, USA.
2. Gable R. E., Petersen J. F. and Trapasso, L. M., 2007: Essentials of Physical Geography (8th Edition), Thompson, Brooks/Cole, USA.
3. Garrett N., 2000: Advanced Geography, Oxford University Press.
4. Goudie, A., 1984: The Nature of the Environment: An Advanced Physical Geography, Basil Blackwell Publishers, Oxford.
5. Hamblin, W. K., 1995: Earth's Dynamic System, Prentice Hall, N.J.
6. Husain M., 2002: Fundamentals of Physical Geography, Rawat Publications, Jaipur.
7. Monkhouse, F. J. 2009: Principles of Physical Geography, Platinum Publishers, Kolkata.
8. Strahler A. N. and Strahler A. H., 2008: Modern Physical Geography, John Wiley & Sons, New York.

CGP- 108
Practical -I; Geography Lab--I

(Credits: 02, 60 Hours (4hrs. per week))

Max. Marks: 50

Time: 4 Hours

Note:-Distribution of Marks is as under:

Exercise – 60

Record File- 20

Viva-voce-20

1. For giving marks under Lab. Record each college will maintain practical assessment record by using the following procedure:-

Each student has to perform a minimum number of exercises/experiments prescribed in the syllabus. After the completion of a practical the teacher concerned will check the note book and – voce of each student to find out how much concepts related to the theoretical and experimental part of the experiment he/ she has understood. According to his/her performance marks will be recorded on their practical note-book. These marks will constitute the lab. Record.

2. To compute the final marks for lab. Record, a separate register will be maintained. Each student will be assigned separate page on this register. On this page the marks obtained by the student in different practical's will be entered. This record will be signed by the concerned teacher.
3. The laboratory Record register will be presented to the external practical examiners for Lab.Record marks. These external examiners may verify the record randomly.

Exercises:

1.	Methods of representing relief.	1
2.	Representation of Topographical features by contours. Slopes (Concave, convex and undulating) Valleys (V Shaped, U shaped and Gorge) Ridges (Volcanic hill, Plateau and Escarpment)	3
3.	Drawing of Profiles (a) Cross Profiles: Serial, superimposed, projected and composite profiles. (b) Longitudinal profiles	5
4.	Interpretation of Topographical and weather maps	2
5.	Chain & Tape Survey	2

Suggested Readings:

1. F.J. Monkhouse and H.R. Wilkinson (1972) Maps and Diagrams, Mothuen and Co. Ltd., London.
2. L.R. Singh and Raghuvander Singh (1973), Map Work and Practical Geography, Central Book Depot, Allahabad.
3. R.I. Singh and P.K. Dutt (1968), Elements of Practical Geography, Students Friends, Allahabad
4. Singh Gopal (2004) 4th edition, Map Work and Practical Geography, Vikas Publication House, New Delhi.

CGL- 202
Core Course-III
HUMAN GEOGRAPHY-I
(Credits: 02, 30 Hrs (2Hrs /week))

Marks for Major Test (External): 80

Marks for Internal Exam: 20

Time: 3 Hours

Paper setter is required to set nine questions in all. Question no. 1 is compulsory and is based on the entire syllabus consisting of eight to ten short answer type questions each of 2 marks. The remaining eight questions are to be set uniformly having two questions from each unit. The student is required to attempt five questions in all selecting one question from each unit and Question No. 1 is compulsory.

Unit-I

Definition, Nature & Scope of Human Geography

Major Branches of Human Geography

Unit-II

Concepts of Human Geography- Environmental Determinism, Possibilism,
Neo-Determinism

Contemporary Relevance of Human Geography

Unit-III

Evolution of Man : Classification and Characteristics of Human races, Griffith
Taylor's Classification

Human Adaption to Environment – Gujjars-Bakarwals and Bushman

Unit-IV

Cultural Regions of the World

Major Religion & Languages of the World and their Distribution

CGL- 203
Core Course-IV
HUMAN GEOGRAPHY-II
Credits: 02, 30 Hrs (2Hrs /week))

Marks for Major Test (External): 80

Marks for Internal Exam: 20

Time: 3 Hours

Paper setter is required to set nine questions in all. Question no. 1 is compulsory and is based on the entire syllabus consisting of eight to ten short answer type questions each of 2 marks. The remaining eight questions are to be set uniformly having two questions from each unit. The student is required to attempt five questions in all selecting one question from each unit and Question No. 1 is compulsory.

Unit-I

World Population Distribution
World Population Composition (Age, Sex and Literacy)

Unit-II

World Population Density and Growth
Demographic Transition Theory

Unit-III

Classification of rural and urban settlements
Trends and Patterns of World Urbanisation

Unit-IV

Theories of Morphological Structure of Urban Centres, Burgess, Homer Hyot, Harris-Ullman.

Reading List

1. Chandna, R.C. (2010) Population Geography, Kalyani Publisher.
2. Daniel, P.A. and Hopkinson, M.F. (1989) The Geography of Settlement, Oliver & Boyd, London.
3. Johnston R; Gregory D, Pratt G. et al. (2008) The Dictionary of Human Geography, Blackwell Publication.
4. Jordan-Bychkov et al. (2006) The Human Mosaic: A Thematic Introduction to Cultural Geography. W. H. Freeman and Company, New York.
5. Kaushik, S.D. (2010) Manav Bhugol, Rastogi Publication, Meerut.
6. Maurya, S.D. (2012) Manav Bhugol, Sharda Pustak Bhawan. Allahabad.
7. Ghosh, S. (2015) Introduction to settlement geography. Orient Black Swan Private Ltd., Kolkata
8. Hussain, Majid (2012) Manav Bhugol. Rawat Publications, Jaipur

CGP- 208
Practical -II; Geography Lab--II
(Credits: 02, 60 Hours (4hrs. per week))

Max. Marks: 50

Time: 4 Hours

Note:-Distribution of Marks is as under:

Exercise – 60
Record File- 20
Viva-voce-20

1. For giving marks under Lab. Record each college will maintain practical assessment record by using the following procedure:-
Each student has to perform a minimum number of exercises/experiments prescribed in the syllabus.

After the completion of a practical the teacher concerned will check the note book and conduct the Viva – voce of each student to find out how much concepts related to the theoretical and experimental part of the experiment he/ she has understood. According to his/her performance marks will be recorded on their practical note-book. These marks will constitute the lab. Record.

2. To compute the final marks for lab. Record, a separate register will be maintained. Each student will be assigned separate page on this register. On this page the marks obtained by the student in different practical's will be entered. This record will be signed by the concerned teacher.
3. The laboratory Record register will be presented to the external practical examiners for Lab.Record marks. These external examiners may verify the record randomly.

1.	Map Scales.	Exercises
i)	Method of Expressing a Scale	4
ii)	Conversion of Statement of Scale into R.F. and Vice-versa.	
iii)	Plain Scale (Km and mile)	
iv)	Comparative Scale	
v)	Diagonal Scale	
2.	Measurement of Distances and Areas on Maps	1
3.	Enlargement and Reduction of Maps	2
4.	Qualitative Map : Choroschematic and Chorocromatic	2
	Quantitative Map: Dot Method and Choropleth	2
5.	Plain Table Survey	2

1. F.J. Monkhouse and H.R. Wilkinson (1972) Maps and Diagrams, Mothuen and Co. Ltd., London
2. L.R. Singh and Raghuvander Singh (1973), Map Work and Practical Geography, Central Book Depot, Allahabad.
3. R.I. Singh and P.K. Dutt (1968), Elements of Practical Geography, Students Friends, Allahabad.
4. Singh Gopal (2004) 4th edition, Map Work and Practical Geography, Viksa Publication House.

SEMESTER I&II
B. SC. PHYSICAL SCIENCES
(CHEMISTRY)

CCL- 104
Core Course-I
INORGANIC CHEMISTRY--I
(ATOMIC STRUCTURE AND BONDING)
(Credits: 02;30 Hrs (2Hrs /week))

Marks for Major Test (External): 80

Marks for Internal Exam: 20

Time: 3 Hours

Paper setter is required to set nine questions in all. Question no. 1 is Compulsory and is based on the entire syllabus consisting of eight to ten short answer type questions each of 2 marks. The remaining eight questions is to be set uniformly having two questions from each unit. The student is required to attempt five questions in all selecting one question from each unit and Question no. 1 is Compulsory wherein student is required to attempt 8 parts.

UNIT-I

Atomic Structure-I

(8 Hours)

Review of: Bohr's theory and its limitations, dual behaviour of matter and radiation, de Broglie's relation, Heisenberg Uncertainty principle. Hydrogen atom spectra. Need of a new approach to Atomic structure.

What is Quantum mechanics? Time independent Schrodinger equation and meaning of various terms in it. Significance of ψ and ψ^2 , Schrödinger equation for hydrogen atom. Radial and angular parts of the hydrogenic wavefunctions (atomic orbitals) and their variations for 1s, 2s, 2p, 3s, 3p and 3d orbitals (Only graphical representation).

UNIT-II

Atomic Structure-II

(7 Hours)

Radial and angular nodes and their significance. Radial distribution functions and the concept of the most probable distance with special reference to 1s and 2s atomic orbitals. Significance of quantum numbers, orbital angular momentum and quantum numbers m_l and m_s . Shapes of s, p and d atomic orbitals, nodal planes. Discovery of spin, spin quantum number (s) and magnetic spin quantum number (m_s).

Rules for filling electrons in various orbitals, Electronic configurations of the atoms. Stability of half-filled and completely filled orbitals, concept of exchange energy. Relative energies of atomic orbitals, Anomalous electronic configurations.

UNIT-III

Chemical Bonding

(8 Hours)

Ionic Bonding: General characteristics of ionic bonding. Energy considerations in ionic bonding, lattice energy and solvation energy and their importance in the context of stability and solubility of ionic compounds. Statement of Born-Landé equation for calculation of lattice energy, Born-Haber cycle and its applications, polarizing power and polarizability. Fajan's rules, ionic character in covalent compounds, bond moment, dipole moment and percentage ionic character.

Covalent bonding: VB Approach: Shapes of some inorganic molecules and ions on the basis of VSEPR and hybridization with suitable examples of linear, trigonal planar, square planar, tetrahedral, trigonal bipyramidal and octahedral arrangements.

Concept of resonance and resonating structures in various inorganic and organic compounds.

UNIT-IV

Molecular Structure

(7 Hours)

MO Approach: Rules for the LCAO method, bonding and antibonding MOs and their characteristics for *s-s*, *s-p* and *p-p* combinations of atomic orbitals, nonbonding combination of orbitals, MO treatment of homonuclear diatomic molecules of 1st and 2nd periods (including idea of *s-p* mixing) and heteronuclear diatomic molecules such as CO, NO and NO⁺. Comparison of VB and MO approaches.

Reference Books:

- Lee, J.D. *Concise Inorganic Chemistry* ELBS, 1991.
- Cotton, F.A., Wilkinson, G. & Gaus, P.L. *Basic Inorganic Chemistry*, 3rd ed., Wiley.
- Douglas, B.E., McDaniel, D.H. & Alexander, J.J. *Concepts and Models in Inorganic Chemistry*, John Wiley & Sons.
- Huheey, J.E., Keiter, E.A., Keiter, R.L. & Medhi, O.K. *Inorganic Chemistry: Principles of Structure and Reactivity*, Pearson Education India, 2006.

CCL- 105
Core Course-II
ORGANIC CHEMISTRY--I
(GENERAL ORGANIC CHEMISTRY & ALIPHATIC
HYDROCARBONS)
(Credits: 02, 30 Hrs (2Hrs /week)))

Marks for Major Test (External): 80

Marks for Internal Exam: 20

Time: 3 Hours

Paper setter is required to set nine questions in all. Question no. 1 is Compulsory and is based on the entire syllabus consisting of eight to ten short answer type questions each of 2 marks. The remaining eight questions is to be set uniformly having two questions from each unit. The student is required to attempt five questions in all selecting one question from each unit and Question no. 1 is Compulsory wherein student is required to attempt 8 parts.

UNIT-I

Fundamentals of Organic Chemistry

(7 Hours)

Physical Effects, Electronic Displacements: Inductive Effect, Electromeric Effect, Resonance and Hyperconjugation. Cleavage of Bonds: Homolysis and Heterolysis.

Structure, shape and reactivity of organic molecules: Nucleophiles and electrophiles. Reactive Intermediates: Carbocations, Carbanions and free radicals.

Strength of organic acids and bases: Comparative study with emphasis on factors affecting pK values. Aromaticity: Benzenoids and Hückel's rule.

UNIT-II

Stereochemistry

(8 Hours)

Conformations with respect to ethane, butane and cyclohexane. Interconversion of Wedge Formula, Newmann, Sawhorse and Fischer representations. Concept of chirality (upto two carbon atoms). Configuration: Geometrical and Optical isomerism; Enantiomerism, Diastereomerism and Meso compounds). Threo and erythro; D and L; *cis - trans* nomenclature; CIP Rules: R/ S (for upto 2 chiral carbon atoms) and E / Z Nomenclature (for upto two C=C systems).

UNIT-III

Aliphatic Hydrocarbons-I

(8 Hours)

Functional group approach for the following reactions (preparations & reactions) to be studied in context to their structure.

Alkanes: (Upto 5 Carbons). *Preparation:* Catalytic hydrogenation, Wurtz reaction, Kolbe's synthesis, from Grignard reagent. *Reactions:* Free radical Substitution: Halogenation.

Alkenes: (Upto 5 Carbons) *Preparation:* Elimination reactions: Dehydration of alkenes and dehydrohalogenation of alkyl halides (Saytzeff's rule); cis alkenes (Partial catalytic hydrogenation) and trans alkenes (Birch reduction). *Reactions:* cis-

addition (alk. KMnO_4) and trans-addition (bromine), Addition of HX (Markownikoff's and anti-Markownikoff's addition), Hydration, Ozonolysis, oxymercuration-demercuration, Hydroboration-oxidation.

UNIT-IV

Aliphatic Hydrocarbons-II

(7 Hours)

Functional group approach for the following reactions (preparations & reactions) to be studied in context to their structure.

Alkynes: (Upto 5 Carbons) *Preparation:* Acetylene from CaC_2 and conversion into higher alkynes; by dehalogenation of tetra halides and dehydrohalogenation of vicinal-dihalides.

Reactions: formation of metal acetylides, addition of bromine and alkaline KMnO_4 , ozonolysis and oxidation with hot alk. KMnO_4 .

Reference Books:

- Graham Solomon, T.W., Fryhle, C.B. & Snyder, S.A. *Organic Chemistry*, John Wiley & Sons (2014).
- McMurry, J.E. *Fundamentals of Organic Chemistry*, 7th Ed. Cengage Learning India Edition, 2013.
- Sykes, P. *A Guidebook to Mechanism in Organic Chemistry*, Orient Longman, New Delhi (1988).
- Eliel, E.L. *Stereochemistry of Carbon Compounds*, Tata McGraw Hill education, 2000.
- Finar, I.L. *Organic Chemistry* (Vol. I & II), E.L.B.S.
- Morrison, R.T. & Boyd, R.N. *Organic Chemistry*, Pearson, 2010.
- Bahl, A. & Bahl, B.S. *Advanced Organic Chemistry*, S. Chand, 2010.

Practical -I; Chemistry Lab--I
ATOMIC STRUCTURE, BONDING, GENERAL ORGANIC CHEMISTRY & ALIPHATIC HYDROCARBONS
(Credits: 02, 60 Hours (4hrs. per week))

Marks: 50

Time: 4 Hours

Section A: Inorganic Chemistry - Volumetric Analysis

1. Estimation of sodium carbonate and sodium hydrogen carbonate present in a mixture.
2. Estimation of oxalic acid by titrating it with KMnO_4 .
3. Estimation of water of crystallization in Mohr's salt by titrating with KMnO_4 .
4. Estimation of Fe (II) ions by titrating it with $\text{K}_2\text{Cr}_2\text{O}_7$ using internal indicator.
5. Estimation of Cu (II) ions iodometrically using $\text{Na}_2\text{S}_2\text{O}_3$.

Section B: Organic Chemistry

1. Detection of extra elements (N, S, Cl, Br, I) in organic compounds (containing upto two extra elements)
2. Separation of mixtures by Chromatography: Measure the R_f value in each case (combination of two compounds to be given)
 - (a) Identify and separate the components of a given mixture of two amino acids (glycine, aspartic acid, glutamic acid, tyrosine or any other amino acid) by paper chromatography
 - (b) Identify and separate the sugars present in the given mixture by paper chromatography.

Reference Books:

- Svehla, G. *Vogel's Qualitative Inorganic Analysis*, Pearson Education, 2012.
- Mendham, J. *Vogel's Quantitative Chemical Analysis*, Pearson, 2009.
- Vogel, A.I., Tatchell, A.R., Furnis, B.S., Hannaford, A.J. & Smith, P.W.G., *Textbook of Practical Organic Chemistry*, Prentice-Hall, 5th edition, 1996.
- Mann, F.G. & Saunders, B.C. *Practical Organic Chemistry* Orient-Longman, 1960.

CCL 204
Core Course-III
PHYSICAL CHEMISTRY--I
(CHEMICAL ENERGETICS AND EQUILIBRIA)
(Credits: 02; 30 Hrs (2Hrs /week))

Marks for Major Test (External): 80

Marks for Internal Exam: 20

Time: 3 Hours

Paper setter is required to set nine questions in all. Question no. 1 is Compulsory and is based on the entire syllabus consisting of eight to ten short answer type questions each of 2 marks. The remaining eight questions is to be set uniformly having two questions from each unit. The student is required to attempt five questions in all selecting one question from each unit and Question no. 1 is Compulsory wherein student is required to attempt 8 parts.

UNIT-I

Chemical Energetics

(8 Hours)

Review of thermodynamics and the Laws of Thermodynamics.

Important principles and definitions of thermochemistry. Concept of standard state and standard enthalpies of formations, integral and differential enthalpies of solution and dilution. Calculation of bond energy, bond dissociation energy and resonance energy from thermochemical data. Variation of enthalpy of a reaction with temperature – Kirchhoff's equation.

Statement of Third Law of thermodynamics and calculation of absolute entropies of substances.

UNIT-II

Chemical Equilibrium

(8 Hours)

Free energy change in a chemical reaction. Thermodynamic derivation of the law of chemical equilibrium. Distinction between G and G^0 , Le Chatelier's principle. Relationships between K_p , K_c and K_x for reactions involving ideal gases.

UNIT-III

Ionic Equilibria-I

(7 Hours)

Strong, moderate and weak electrolytes, degree of ionization, factors affecting degree of ionization, ionization constant and ionic product of water. Ionization of weak acids and bases, pH scale, common ion effect.

UNIT-IV

Ionic Equilibria-II

(7 Hours)

Salt hydrolysis-calculation of hydrolysis constant, degree of hydrolysis and pH for different salts. Buffer solutions. Solubility and solubility product of sparingly soluble salts – applications of solubility product principle.

Reference Books:

- Barrow, G.M. *Physical Chemistry* Tata McGraw-Hill (2007).
- Castellan, G.W. *Physical Chemistry* 4th Ed. Narosa (2004).
- Kotz, J.C., Treichel, P.M. & Townsend, J.R. *General Chemistry* Cengage Learning India Pvt. Ltd., New Delhi (2009).
- Mahan, B.H. *University Chemistry* 3rd Ed. Narosa (1998).
- Petrucci, R.H. *General Chemistry* 5th Ed. Macmillan Publishing Co.: New York (1985).

CCL 205

Core Course-IV ORGANIC CHEMISTRY--II (FUNCTIONAL GROUP ORGANIC CHEMISTRY) (Credits: 02; 30 Hrs (2Hrs /week)))

Marks for Major Test (External): 80

Marks for Internal Exam: 20

Time: 3 Hours

Paper setter is required to set nine questions in all. Question no. 1 is Compulsory and is based on the entire syllabus consisting of eight to ten short answer type questions each of 2 marks. The remaining eight questions is to be set uniformly having two questions from each unit. The student is required to attempt five questions in all selecting one question from each unit and Question no. 1 is Compulsory wherein student is required to attempt 8 parts.

UNIT-I

Functional group approach for the following reactions (preparations & reactions) to be studied in context to their structure for all UNITS I-IV.

Aromatic hydrocarbons

(7 Hours)

Preparation (Case benzene): from phenol, by decarboxylation, from acetylene, from benzene sulphonic acid.

Reactions: (Case benzene): Electrophilic substitution: nitration, halogenation and sulphonation. Friedel-Craft's reaction (alkylation and acylation) (upto 4 carbons on benzene). Side chain oxidation of alkyl benzenes (upto 4 carbons on benzene).

UNIT-II

Alkyl and Aryl Halides

(8 Hours)

Alkyl Halides (Upto 5 Carbons) Types of Nucleophilic Substitution (S_N1 , S_N2 and S_Ni) reactions.

Preparation: from alkenes and alcohols.

Reactions: hydrolysis, nitrite & nitro formation, nitrile & isonitrile formation.

Williamson's ether synthesis: Elimination vs substitution.

Aryl Halides *Preparation:* (Chloro, bromo and iodo-benzene case): from phenol, Sandmeyer & Gattermann reactions.

Reactions (Chlorobenzene): Aromatic nucleophilic substitution (replacement by –OH group) and effect of nitro substituent. Benzyne Mechanism: KNH_2/NH_3 (or $NaNH_2/NH_3$).

Reactivity and Relative strength of C-Halogen bond in alkyl, allyl, benzyl, vinyl and aryl halides.

UNIT-III

Alcohols, Phenols and Ethers (Upto 5 Carbons)

(8 Hours)

Alcohols: *Preparation:* Preparation of 1^o, 2^o and 3^o alcohols: using Grignard reagent, Ester hydrolysis, Reduction of aldehydes, ketones, carboxylic acid and esters.

Reactions: With sodium, HX (Lucas test), esterification, oxidation (with PCC, alk. KMnO₄, acidic dichromate, conc. HNO₃). Oppeneauer oxidation *Diols:* (Upto 6 Carbons) oxidation of diols. Pinacol-Pinacolone rearrangement.

Phenols: (Phenol case) *Preparation:* Cumene hydroperoxide method, from diazonium salts. *Reactions:* Electrophilic substitution: Nitration, halogenation and sulphonation. Reimer-Tiemann Reaction, Gattermann-Koch Reaction, Houben–Hoesch Condensation, Schotten – Baumann Reaction.

Ethers (aliphatic and aromatic): Cleavage of ethers with HI.

UNIT-IV

Aldehydes and ketones (aliphatic and aromatic)

(7 Hours)

(Formaldehyde, acetaldehyde, acetone and benzaldehyde)

Preparation: from acid chlorides and from nitriles.

Reactions – Reaction with HCN, ROH, NaHSO₃, NH₂-G derivatives. Iodoform test. Aldol Condensation, Cannizzaro's reaction, Wittig reaction, Benzoin condensation. Clemensen reduction and Wolff Kishner reduction. Meerwein-Ponndorf Verley reduction.

Reference Books:

- Graham Solomon, T.W., Fryhle, C.B. & Snyder, S.A. *Organic Chemistry*, John Wiley & Sons (2014).
- McMurry, J.E. *Fundamentals of Organic Chemistry*, 7th Ed. Cengage Learning India Edition, 2013.
- Sykes, P. *A Guidebook to Mechanism in Organic Chemistry*, Orient Longman, New Delhi (1988).
- Finar, I.L. *Organic Chemistry* (Vol. I & II), E.L.B.S.
- Morrison, R.T. & Boyd, R.N. *Organic Chemistry*, Pearson, 2010.
- Bahl, A. & Bahl, B.S. *Advanced Organic Chemistry*, S. Chand, 2010.

CCP 209
Practical -II
Chemistry Lab--II
CHEMICAL ENERGETICS, EQUILIBRIA & FUNCTIONAL ORGANIC
CHEMISTRY
(Credits: 02; 60 Hrs (4Hrs /week))

Marks: 50

Time: 4 Hours

Section A: Physical Chemistry

Thermochemistry

1. Determination of heat capacity of calorimeter for different volumes.
2. Determination of enthalpy of neutralization of hydrochloric acid with sodium hydroxide.
3. Determination of enthalpy of ionization of acetic acid.
4. Determination of integral enthalpy of solution of salts (KNO₃, NH₄Cl).
5. Determination of enthalpy of hydration of copper sulphate.
6. Study of the solubility of benzoic acid in water and determination of *H. Ionic equilibria* pH measurements
 - a) Measurement of pH of different solutions like aerated drinks, fruit juices, shampoos and soaps (use dilute solutions of soaps and shampoos to prevent damage to the glass electrode) using pH-meter.
 - b) Preparation of buffer solutions:
 - (i) Sodium acetate-acetic acid
 - (ii) Ammonium chloride-ammonium hydroxide

Measurement of the pH of buffer solutions and comparison of the values with theoretical values.

Section B: Organic Chemistry

1. Purification of organic compounds by crystallization (from water and alcohol) and distillation.
2. Criteria of Purity: Determination of melting and boiling points.
3. Preparations: Mechanism of various reactions involved to be discussed. Recrystallisation, determination of melting point and calculation of quantitative yields to be done.
 - (a) Bromination of Phenol/Aniline
 - (b) Benzoylation of amines/phenols
 - (c) Oxime and 2,4-dinitrophenylhydrazone of aldehyde/ketone

Reference Books

- Vogel, A.I., Tatchell, A.R., Furnis, B.S., Hannaford, A.J. & Smith, P.W.G., *Textbook of Practical Organic Chemistry*, Prentice-Hall, 5th edition, 1996.
- Mann, F.G. & Saunders, B.C. *Practical Organic Chemistry* Orient-Longman, 1960.
- Khosla, B. D.; Garg, V. C. & Gulati, A. *Senior Practical Physical Chemistry*, R. Chand & Co.: New Delhi (2011).

SEMESTER I & II
B. SC. PHYSICAL SCIENCES
(ELECTRONICS)

CEL- 104
Core Course-I
NETWORK ANALYSIS AND ELECTRONIC DEVICES
(Credits: 02;30 Hrs (2Hrs /week))

Marks for Major Test (External): 80

Marks for Internal Exam: 20

Time: 3 Hours

Paper setter is required to set nine questions in all. Question no. 1 is Compulsory and is based on the entire syllabus consisting of eight to ten short answer type questions each of 2 marks. The remaining eight questions are to be set uniformly having two questions from each unit. The student is required to attempt five questions in all selecting one question from each unit and Question no. 1 is Compulsory wherein student is required to attempt 8 parts.

UNIT-I

(8 Hours)

Circuit Analysis:

Concept of Voltage and Current Sources. Kirchhoff's Current Law, Kirchhoff's Voltage Law. Mesh Analysis. Node Analysis.

UNIT-II

(8 Hours)

Networks:

Star and Delta networks, Star-Delta Conversion. Principle of Duality. Superposition Theorem. Thevenin Theorem. Norton's Theorem.

UNIT-III

(8 Hours)

Networks:

Reciprocity Theorem. Maximum Power Transfer Theorem. Two Port Networks: h, y and z parameters and their conversion.

UNIT-IV

(6 Hours)

Unipolar Devices:

JFET. Construction, working and I-V characteristics (output and transfer), Pinchoff voltage. UJT, basic construction, working, equivalent circuit and I-V characteristics.

Reference Books:

- Electric Circuits, S. A. Nasar, Schaum's outline series, Tata McGraw Hill (2004)
- Electrical Circuits, M. Nahvi & J. Edminister, Schaum's Outline Series, Tata McGraw-Hill (2005)
- Electrical Circuits, K.A. Smith and R.E. Alley, 2014, Cambridge University Press
- Network, Lines and Fields, J.D.Ryder, Prentice Hall of India.
- Electrical Circuit Analysis, Mahadevan and Chitra, PHI Learning
- Network Analysis, G.K. Mithal, Khanna Publication
- Basic Electronics and Linear Circuits, N.N Bhargava, D C Kulshreshtha
- Electronic Devices and Circuits, David A. Bell, 5th Edition 2015, Oxford University Press.
- Electronic Circuits: Discrete and Integrated, D.L. Schilling and C. Belove, Tata McGraw Hill
- Microelectronic circuits, A.S. Sedra, K.C. Smith, A.N. Chandorkar, 2014, 6th Edn., Oxford University Press.
- J. Millman and C. C. Halkias, Integrated Electronics, Tata McGraw Hill (2001)
- J. J. Cathey, 2000 Solved Problems in Electronics, Schaum's outline Series, Tata McGraw Hill (1991)

CEL- 105
Core Course-II
ANALOG ELECTRONICS
(Credits: 02, 30 Hrs (2Hrs /week))

Marks for Major Test (External): 80

Marks for Internal Exam: 20

Time: 3 Hours

Paper setter is required to set nine questions in all. Question no. 1 is Compulsory and is based on the entire syllabus consisting of eight to ten short answer type questions each of 2 marks. The remaining eight questions is to be set uniformly having two questions from each unit. The student is required to attempt five questions in all selecting one question from each unit and Question no. 1 is Compulsory wherein student is required to attempt 8 parts.

UNIT-I

(8 Hours)

Junction Diode:

PN junction diode (Ideal and practical)-constructions, Formation of Depletion Layer, Diode Equation and I-V characteristics. Idea of static and dynamic resistance, dc load line analysis, Quiescent (Q) point. Zener diode, Reverse saturation current, Zener and avalanche breakdown. Qualitative idea of Schottky diode.

Junction Diode Applications:

Rectifiers- Half wave rectifier, Full wave rectifiers (center tapped and bridge), circuit diagrams, working and waveforms, ripple factor and efficiency. Filter-Shunt capacitor filter, its role in power supply, output waveform, and working. Regulation- Line and load regulation, Zener diode as voltage regulator, and explanation for load and line regulation.

UNIT-II

(8 Hours)

Bipolar Junction Transistor:

Review of the characteristics of transistor in CE and CB configurations, Regions of operation (active, cut off and saturation), Current gains α and β . Relations between α and β . dc load line and Q point. Transistor biasing and Stabilization circuits- Fixed Bias and Voltage Divider Bias. Thermal runaway, stability and stability factor S.

UNIT-III

(7 Hours)

Amplifiers:

Transistor as a two port network, h-parameter equivalent circuit. Small signal analysis of single stage CE amplifier. Input and Output impedance, Current and Voltage gains. Class A, B and C Amplifiers.

Cascaded Amplifiers:

Two stage RC Coupled Amplifier and its Frequency Response.

UNIT-IV

(7 Hours)

Feedback in Amplifiers:

Concept of feedback, negative and positive feedback, advantages of negative feedback

Sinusoidal Oscillators:

Barkhausen criterion for sustained oscillations. Phase shift and Colpitt's oscillator. Determination of Frequency and Condition of oscillation.

Reference Books:

- Electronic Devices and Circuits, David A. Bell, 5th Edition 2015, Oxford University Press.
- Basic Electronics and Linear Circuits, N.N Bhargava, D C Kulshreshtha
- Electronic Circuits: Discrete and Integrated, D.L. Schilling and C. Belove, Tata McGraw Hill
- Microelectronic circuits, A.S. Sedra, K.C. Smith, A.N. Chandorkar, 2014, 6th Edn., Oxford University Press.
- J. Millman and C. C. Halkias, Integrated Electronics, Tata McGraw Hill (2001)
- J. J. Cathey, 2000 Solved Problems in Electronics, Schaum's outline Series, Tata McGraw Hill (1991)

CEP- 109
Practical -I; NETWORK ANALYSIS AND ANALOG ELECTRONICS
LAB (Credits: 02, 60 Hours (4hrs. per week))

Marks: 50

Time: 4 Hours

AT LEAST 12 EXPERIMENTS FROM THE FOLLOWING BESIDES #1

6. To familiarize with basic electronic components (R, C, L, diodes, transistors), digital Multimeter, Function Generator and Oscilloscope.
7. Measurement of Amplitude, Frequency & Phase difference using Oscilloscope.
8. Verification of (a) Thevenin's theorem and (b) Norton's theorem.
9. Verification of (a) Superposition Theorem and (b) Reciprocity Theorem.
10. Verification of the Maximum Power Transfer Theorem.
11. Study of the I-V Characteristics of (a) p-n junction Diode, and (b) Zener diode.
12. Study of (a) Half wave rectifier and (b) Full wave rectifier (FWR).
13. Study the effect of (a) C- filter and (b) Zener regulator on the output of FWR.
14. Study of the I-V Characteristics of UJT and design relaxation oscillator..
15. Study of the output and transfer I-V characteristics of common source JFET.
16. Study of Fixed Bias and Voltage divider bias configuration for CE transistor.
17. Design of a Single Stage CE amplifier of given gain.
18. Study of the RC Phase Shift Oscillator.
19. Study the Colpitt's oscillator.

Reference Books:

- Networks, Lines and Fields, J.D.Ryder, Prentice Hall of India.
- J. Millman and C. C. Halkias, Integrated Electronics, Tata McGraw Hill (2001)
- Electrical Circuits, M. Nahvi and J. Edminister, Schaum's Outline Series, Tata McGraw-Hill (2005)
- Allen Mottershead, Electronic Devices & Circuits, Goodyear Publishing Corporation.

CEL 204
Core Course-III
LINEAR AND DIGITAL INTEGRATED CIRCUITS
(Credits: 02; 30 Hrs (2Hrs /week))

Marks for Major Test (External): 80

Marks for Internal Exam: 20

Time: 3 Hours

Paper setter is required to set nine questions in all . Question no. 1 is Compulsory and is based on the entire syllabus consisting of eight to ten short answer type questions each of 2 marks. The remaining eight questions is to be set uniformly having two questions from each unit. The student is required to attempt five questions in all selecting one question from each unit and Question no. 1 is Compulsory wherein student is required to attempt 8 parts.

UNIT-I

Operational Amplifiers (Black box approach):

(8 Hours)

Power supplies for ICs, Interpretation of data sheets, Characteristics of an Ideal and Practical Operational Amplifier (IC 741), Ideal voltage transfer curve, Open and closed loop configuration, Frequency Response. CMRR. Slew Rate and concept of Virtual Ground.

UNIT-II

Applications of Op-Amps:

(8 Hours)

(1) Inverting and non-inverting amplifiers, (2) Summing and Difference Amplifier (3) Differentiator, (4) Integrator (5) Voltage to current converter

UNIT-III

Applications of Op-Amps:

(8 Hours)

(6) Active low pass and high pass Butterworth filter (1st and 2nd order) (7) Wein bridge oscillator (8) Square wave generator(9) Comparator and Zero-crossing detector (10) clippers and clampers

UNIT-IV

D-A and A-D Conversion:

(6 Hours)

4 bit binary weighted and R-2R D-A converters, circuit and working. Accuracy and Resolution. A-D conversion characteristics, successive approximation ADC. (Mention of relevant ICs for all).

Reference Books:

- OP-Amps and Linear Integrated Circuit, R. A. Gayakwad, 4th edition, 2000, Prentice Hall
- Operational Amplifiers and Linear ICs, David A. Bell, 3rd Edition, 2011, Oxford University Press.
- Digital Principles and Applications, A.P. Malvino, D.P. Leach and Saha, 7th Ed., 2011, Tata McGraw
- Fundamentals of Digital Circuits, Anand Kumar, 2nd Edn, 2009, PHI Learning Pvt. Ltd.

CEL 205
Core Course-IV
DIGITAL ELECTRONICS
(Credits: 02; 30 Hrs (2Hrs /week))

Marks for Major Test (External): 80

Marks for Internal Exam: 20

Time: 3 Hours

Paper setter is required to set nine questions in all. Question no. 1 is Compulsory and is based on the entire syllabus consisting of eight to ten short answer type questions each of 2 marks. The remaining eight questions is to be set uniformly having two questions from each unit. The student is required to attempt five questions in all selecting one question from each unit and Question no. 1 is Compulsory wherein student is required to attempt 8 parts.

UNIT-I

(8 Hours)

Number System and Codes:

Decimal, Binary, Octal and Hexadecimal number systems, base conversions.

Representation of signed and unsigned numbers, BCD code. Binary, octal and hexadecimal arithmetic; addition, subtraction by 2's complement method, multiplication. **Logic Gates**

and Boolean algebra:

Truth Tables of OR, AND, NOT, NOR, NAND, XOR, XNOR, Universal Gates, Basic postulates and fundamental theorems of Boolean algebra.

UNIT-II

(8 Hours)

Combinational Logic Analysis and Design:

Standard representation of logic functions(SOP and POS), Minimization

Techniques (Karnaugh map minimization up to 4 variables for SOP). **Arithmetic**

Circuits:

Binary Addition. Half and Full Adder. Half and Full Subtractor, 4-bit binary Adder/Subtractor.

Data processing circuits:

Multiplexers, De-multiplexers, Decoders, Encoders.

.

UNIT-III

(8 Hours)

Clock and Timer (IC 555):

Introduction, Block diagram of IC 555, Astable and Monostable multivibrator circuits

Sequential Circuits:

SR, D, and JK Flip-Flops. Clocked (Level and Edge Triggered) Flip-Flops. Preset and Clear operations. Race-around conditions in JK Flip-Flop. Master-slave JK Flip-Flop.

UNIT-IV

(6 Hours)

Shift registers:

Serial-in-Serial-out, Serial-in-Parallel-out, Parallel-in-Serial-out and Parallel-in-Parallel-out Shift Registers (only up to 4 bits).

Counters (4 bits):

Ring Counter. Asynchronous counters, Decade Counter. Synchronous Counter.

Reference Books:

- Digital Principles and Applications, A.P. Malvino, D.P. Leach and Saha, 7th Ed., 2011, Tata McGraw
- Fundamentals of Digital Circuits, Anand Kumar, 2nd Edn, 2009, PHI Learning Pvt. Ltd.
- Digital Circuits and systems, Venugopal, 2011, Tata McGraw Hill.
- Digital Systems: Principles & Applications, R.J. Tocci, N.S. Widmer, 2001, PHI Learning.
- Thomas L. Floyd, Digital Fundamentals, Pearson Education Asia (1994)
- R. L. Tokheim, Digital Principles, Schaum's Outline Series, Tata McGraw-Hill (1994)

CEP 209
Practical -II; LINEAR INTEGRATED CIRCUITS AND DIGITAL ELECTRONICS
LAB
(Credits: 02; 60 Hrs (4Hrs /week))

Marks: 50
Time: 4 Hours

At least 04 experiments each from section A, B and C

Section-A: Op-Amp. Circuits (Hardware)

1. To design an inverting amplifier using Op-amp (741,351) for dc voltage of given gain
2. (a) To design inverting amplifier using Op-amp (741,351) & study its frequency response
(b) To design non-inverting amplifier using Op-amp (741,351) & study frequency response
3. (a) To add two dc voltages using Op-amp in inverting and non-inverting mode
(b) To study the zero-crossing detector and comparator.
4. To design a precision Differential amplifier of given I/O specification using Op-amp.
5. To investigate the use of an op-amp as an Integrator.
6. To investigate the use of an op-amp as a Differentiator.
7. To design a Wien bridge oscillator for given frequency using an op-amp.
8. To design a circuit to simulate the solution of simultaneous equation and 1st/2nd order differential equation.
9. Design a Butterworth Low Pass active Filter (1st order) & study Frequency Response
10. Design a Butterworth High Pass active Filter (1st order) & study Frequency Response
11. Design a digital to analog converter (DAC) of given specifications.

Section-B: Digital circuits (Hardware)

1. (a) To design a combinational logic system for a specified Truth Table.
(b) To convert Boolean expression into logic circuit & design it using logic gate ICs.
(c) To minimize a given logic circuit.
2. Half Adder and Full Adder.
3. Half Subtractor and Full Subtractor.
4. 4 bit binary adder and adder-subtractor using Full adder IC.
5. To design a seven segment decoder.
6. To design an Astable Multivibrator of given specification using IC 555 Timer.
7. To design a Monostable Multivibrator of given specification using IC 555 Timer.
8. To build Flip-Flop (RS, Clocked RS, D-type and JK) circuits using NAND gates.
9. To build JK Master-slave flip-flop using Flip-Flop ICs
10. To build a Counter using D-type/JK Flip-Flop ICs and study timing diagram.
11. To make a Shift Register (serial-in and serial-out) using D-type/JK Flip-Flop ICs.

Section-C: SPICE/MULTISIM simulations for electronic circuits and devices

1. To verify the Thevenin and Norton Theorems.
2. Design and analyze the series and parallel LCR circuits
3. Design the inverting and non-inverting amplifier using an Op-Amp of given gain
4. Design and Verification of op-amp as integrator and differentiator
5. Design the 1st order active low pass and high pass filters of given cutoff frequency
6. Design a Wein's Bridge oscillator of given frequency.
7. Design clocked SR and JK Flip-Flop's using NAND Gates
8. Design 4-bit asynchronous counter using Flip-Flop ICs
9. Design the CE amplifier of a given gain and its frequency response.

Reference Books :

- Digital Principles and Applications, A.P. Malvino, D.P. Leach and Saha, 7th Ed., 2011, Tata McGraw
- OP-Amps and Linear Integrated Circuit, R. A. Gayakwad, 4th edn., 2000, Prentice Hall
- R. L. Tokheim, Digital Principles, Schaum's Outline Series, Tata McGraw-Hill (1994)
- Digital Electronics, S.K. Mandal, 2010, 1st edition, McGraw Hill

SEMESTER I & II
B. SC. PHYSICAL SCIENCES
(COMPUTER SCIENCE)

CCsL- 104
Core Course-I
COMPUTER FUNDAMENTALS
(Credits: 02, 30 Hrs (2Hrs /week))

Marks for Major Test (External): 80

Marks for Internal Exam: 20

Time: 3 Hours

Paper setter is required to set nine questions in all. Question no. 1 is compulsory and is based on the entire syllabus consisting of eight to ten short answer type questions each of 2 marks. The remaining eight questions are to be set uniformly having two questions from each unit. The student is required to attempt five questions in all selecting one question from each unit and Question No. 1 is compulsory.

UNIT I

Computer Fundamentals:

Introduction to Computers: Characteristics and Limitations of Computers, Evolution of Computers, Classification of Computers. Computer Languages. Computer Programs, Structured Programming Concepts

Basic Computer Organization:

Units of a computer, CPU, ALU, Memory Hierarchy, Registers, I/O devices. Mother Board, **UNIT II**

Word Processing:

Introduction to MS-Word, Creating & Editing: Formatting Document, Page, Table; Bookmark, Mail Merge, Macros.

Spread Sheets:

Introduction to MS-Excel, Creating & Editing Worksheet, Formatting data, Formulas and Functions, Creating Charts, Pivot Tables.

Power Point Presentations:

Creating, Manipulating & Enhancing Slides, Organizational Charts, Animations & Sounds, Inserting Animated Pictures.

UNIT III

Operating Systems:

Introduction to Operating System: Functions of Operating System, Services; Properties: Batch Processing, Multitasking, Multiprogramming, Interactivity, Distributed environment, Spooling;

Types of Operating System:

Single user and Multiuser, Batch OS, Multiprogramming OS, Multitasking OS, Real-Time OS, Time-Sharing OS, Distributed OS, Network OS.

UNIT IV

Internet Basics:

History of Internet, Web Browsers, Web Servers, Hypertext Transfer Protocol, Internet Protocols Addressing, Internet Connection Types, How Internet Works, ISPs, Search Engines, Emails and Its Working, Internet Security, Uses of Internet, Computer Networks and their advantages, Types of Computer Network, Network Topologies, Basics of Transmission Media. Cloud Computing Basics: Overview, Applications, Intranets and the Cloud. Benefits, Limitations and Security Concerns.

Text/ Reference Books

1. Satish Jain, Kratika, M. Geetha, “MS Office”, BPB Publications, 2010.
2. ITL Education Solutio, “Introduction to Computer Science”, Pearson Education, 2nd Edition 2012.
3. P. K. Sinha, “Computer Fundamentals”, 6th edition, 2003.
4. Tony Feldman, “Introduction to Digital Media”, Routledge; 1 edition, 1996.
5. Bartee, Thomas C, “Digital Computer Fundamentals”, McGraw-Hill Inc., 6th Edition, 1984.

CCsL 105
Core Course-II
Programming in 'C'
(Credits: 02, 30 Hrs (2Hrs/week))

Marks for Major Test (External): 80

Marks for Internal Exam: 20

Time: 3 Hours

Paper setter is required to set nine questions in all. Question no. 1 is compulsory and is based on the entire syllabus consisting of eight to ten short answer type questions each of 2 marks. The remaining eight questions are to be set uniformly having two questions from each unit. The student is required to attempt five questions in all selecting one question from each unit and Question No. 1 is compulsory.

UNIT – 1

Introduction to C Programming:

History of C, Character Set, Identifiers and Keywords,

Constants, Types of C Constants, Rules for Constructing Integer, Real and character Constants, Variables, Data Types, rules for constructing variables. Input/output: Unformatted & formatted I/O function, Input functions: scanf(), getch(), getche(), getchar(), gets(); output functions: printf(), putchar(), puts().

Operators and Expressions:

Arithmetic, relational, logical, bitwise, unary, assignment, conditional operators and special operators, Type Conversion in Assignments, Hierarchy of Operations, Structure of a C program.

UNIT – II

Decision Control Structure:

Decision making Decision making with IF statement, IF-ELSE statement, Nested IF statement, ELSE-IF ladder.

Loop Control Structure:

While and do-while, for loop and Nested for loop,

Case Control Structure:

Decision using switch; goto, break and continue statements.

Functions:

Library functions and user defined functions, Global and Local variables, Function Declaration, Calling and definition of function, Methods of parameter passing to functions, recursion, Storage Classes in C.

UNIT – III

Arrays:

Introduction, Array declaration, Accessing values in an array, Initializing values in an array, Single and Two Dimensional Arrays, Initializing a 2-Dimensional Array, Passing array elements to a function: Call by value and call by reference, Arrays of characters, Insertion and deletion operations, Searching the elements in an array, Using matrices in arrays, Passing an Entire Array to a Function.

Pointers:

Pointer declaration, Address operator “&”, Indirection operator “*”, Pointer and arrays, Pointers and 2-Dimensional Arrays, Pointer to an Array, Passing 2-D array to a Function, Array of Pointers.

Dynamic Memory Allocation:

malloc(), calloc(), realloc(), free() functions.

UNIT – IV

String Manipulation in C:

Declaring and Initializing string variables, Reading and writing strings, String Handling functions (strlen(), strcpy(), strcmp(), strcat(), strrev()).

Structures and Unions:

Declaration of structures, Structure Initialization, Accessing structure members, Arrays of structure, Nested structures, Structure with pointers, Union.

Files in C:

Introduction, Opening and Closing files, Basic I/O operation on files.

Text/ Reference Books:

1. Yashvant Kanetkar, “Let Us C”, 15th Edition, BPB Publications, 2016.
2. Salaria, R.S. : Test Your Skills in C, Salaria Publications, New Delhi.
3. E. Balaguruswami : Programming with C Language, Tata McGraw Hill, New Delhi.
4. Byron S. Gottfried : Programming in C, McGraw Hills Publishers, New York.
5. M.T. Somashekara : Programming in C, Prentice Hall of India.

CCsP- 109
Practical –I: Computer Lab--I
Based on Computer Fundamentals
(Credits: 02, 60 Hours (4hrs. per week))

Marks: 50
Time: 4 Hours

List of Experiments:

Section- A

1. Create an admission form in MS-Word. You need to use Text-Boxes, Shapes, Colors, formatting options, table and horizontal lines.
2. Send a birthday invitation to your 100 friends using Mail-Merge.
3. Study and use various functions like Sum, Average, Maximum, and Minimum in MS-Excel.
4. Fill 50 students' records in MS-Excel sheet1. The fields must be Roll No., Name, Father Name, Course Joined, Marks obtained in three subjects. Create a marks-sheet in sheet2.
5. Create 10 slides in MS-PowerPoint related to internet advantages and disadvantages in daily life. Add animations to these all slides.

Section-B

1. Program to convert a given decimal number into its binary equivalent using bitwise operators.
2. Program to accept a positive integer and find the sum of the digits in it.
3. Find The Roots of Quadratic Equation using if else statement.
4. Program to generate prime numbers.
5. Program to multiply two matrices.
6. Program to find GCD and LCM using non-recursive function.
7. Program to generate terms of Fibonacci series using recursive function.
8. Program to read a string and check whether it is a palindrome or not (using library functions).
9. Program to create a file called emp.txt and store information about a person, in terms of his name, age and salary.
10. Program to add two complex numbers using structure to store a complex number.

Note: In addition to the above experiments, the teacher may add more programs on the behalf of the theory syllabus.

CCsL- 204
Core Course-III
Data Structure Using ‘C’
(Credits: 02, 30 Hrs (2Hrs /week))

Marks for Major Test (External): 80

Marks for Internal Exam: 20

Time: 3 Hours

Paper setter is required to set nine questions in all. Question no. 1 is compulsory and is based on the entire syllabus consisting of eight to ten short answer type questions each of 2 marks. The remaining eight questions are to be set uniformly having two questions from each unit. The student is required to attempt five questions in all selecting one question from each unit and Question No. 1 is compulsory.

UNIT – 1

Data Structure Basics:

Introduction to Complexity, Introduction to Data Structures, Classification of data structure, Abstract data type; Data Structure Operations, Applications of Data Structure.

Arrays:

Definition of array, Single and Multi-dimensional Arrays, Representation of single and 2-dimensional arrays and their address calculation, basic operations on single dimensional arrays, Algorithm for insertion and deletion operations; Sparse Matrices and its representation.

Stacks:

Definition of stack, Operations on stack, Algorithms for push and pop operations using array. Stack Applications: Prefix, Infix and Postfix expressions, Conversion of Infix expressions to Postfix expression using stack; Recursion.

UNIT – II

Queues:

Introduction to Queue. Operations on Queues, Circular queue, Algorithm for insertion and deletion in simple queue and circular queue using array. De-queue, Priority Queues.

Linked Lists:

Introduction, Array vs Linked list; Singly, Doubly and Circular linked Lists and representation of linked lists in memory. Implementation of Stack and simple Queue as single Linked List.

UNIT -III

Trees:

Introduction to Tree as a data structure, Basic Terminology; Binary Trees, Traversal of binary trees: In-order, Pre-order & post-order. Binary tree non recursive traversal algorithms. Binary Search Tree, (Creation, and Traversals of Binary Search Trees)

Graphs:

Introduction, Memory Representation, Graph Traversal (DFS and BFS)

UNIT - IV

Searching:

Binary and Linear Search

Sorting:

Bubble sort, Insertion sort, Selection sort, Merge Sort, Quick sort. Comparison of various Searching and Sorting algorithms.

Text/ Reference Books:

1. Ellis Horowitz & Sartaj Sahni, "Fundamentals of Data structures in C", 2nd Edition, Silicon Press, 2007.
2. R. B. Patel, "Expert Data Structures with C", 3rd Edition, Khanna Book Publishing, 2014.
3. A. M. Tenenbaum, Langsam, "Data Structures using 'C'," Pearson Education, 2009.
4. Lipschultz L. Seymour, 2001 : Data Structure, Schaum Outline Series, TMH, New Delhi.
5. Salaria, R. S. : Data Structures & Algorithm Using C, Khanna Book Publishing Co. (P.) Ltd., New Delhi.
6. Salaria, R. S., Test Your Skills in Data Structures, Khanna Book Publishing Co. (P.) Ltd., New Delhi.
7. Sofat Sanjeev, Data Structure with C and C++, Khanna Book Publishing Co. Patel, R.B., Expert Data Structure in C, Khanna Book Publishing Co.

CCsL- 205
Core Course-IV
COMPUTER ORGANISATION
(Credits: 02, 30 Hrs (2Hrs /week))

Marks for Major Test (External): 80

Marks for Internal Exam: 20

Time: 3 Hours

Paper setter is required to set nine questions in all. Question no. 1 is compulsory and is based on the entire syllabus consisting of eight to ten short answer type questions each of 2 marks. The remaining eight questions are to be set uniformly having two questions from each unit. The student is required to attempt five questions in all selecting one question from each unit and Question No. 1 is compulsory.

UNIT – I

Data Representation:

Number Systems: Decimal, Binary, Octal, Hexadecimal, Conversion from one number system to other; Binary arithmetic operations, Representation of Negative Numbers: 1's complement and 2's complement; fixed and floating point representation, character representation (BCD, EBCDIC and ASCII Code), BCD number system; Weighted Codes, Self Complementing Code, Excess-3 code, Gray and Cyclic code.

UNIT – II

Boolean Algebra:

Introduction, Definition, Postulates of Boolean Algebra, Fundamental Theorems of Boolean Algebra; Duality Principle, Demorgan's Theorems, Boolean Expressions and Truth Tables, Standard SOP and POS forms, Canonical representation of Boolean expressions, Simplification of Boolean Expressions using theorems of Boolean algebra, Minimization Techniques for Boolean Expressions using Karnaugh Map.

Logic Gates:

AND, OR, NOT, NOR, NAND & XOR Gates and their Truth tables.

UNIT – III

Combinational Circuits:

Half Adder & Full Adder, Half Subtractor & Full Subtractor, Adder & Subtractor, decoders, multiplexors. Realization of Boolean expressions using decoders and multiplexor.

Sequential Circuits:

Flip-Flops, Types- RS, T, D, JK and Master-Slave JK flip flop, Triggering of Flip Flops; Flip Flop conversions, Shift Registers, Synchronous and Asynchronous Counters.

UNIT – IV

Basic Computer Organization and Design:

Register Organization, Bus system, instruction set, timing and control, instruction cycle, memory reference, input-output and interrupt.

Programming the Basic Computer:

Instruction formats, addressing modes, instruction codes.

Input-output Organization:

Peripheral devices, I/O interface, Modes of data transfer,

Direct Memory Access.

Text/ Reference Books:

1. William H.Gothman, “Digital Electronics-An Introduction to Theory and Practice” 2nd Edition, Prentice Hall of India Pvt. Ltd., 2009.
2. Mano, M. Morris, “Digital Logic and Computer Design”, Prentice Hall of India Pvt.Ltd., 2000.
3. W.Stallings, “Computer Organization & Architecture”, Pearson Education, 7th Edition, New Delhi, 2006.
4. N. Carter, “Computer Architecture”, Schaums Outline Series, Tata McGraw Hill, New Delhi, 2006.

CCsP - 209
Practical –II: Computer Lab--II
Based on Data Structure using 'C' language and Database Management System
(Credits: 02, 60 Hrs (4Hrs /week))

Marks: 50
Time: 4 Hours

List of Experiments:

1. Program to convert a given infix expression to postfix.
2. Program to insert/delete an element in/from an array at a given location.
3. Program to implement Stack using structure
4. Program to implement Single Queue using structure
5. Program to insert, delete and display the linked list (Beginning, End and given position)
6. Program to generate BST and traverse recursively (infix).
7. Program to generate BST and traverse recursively (prefix).
8. Program to generate BST and traverse recursively (postfix).
9. Program for Binary Search.
10. Program for sorting an array using any sorting technique

Note: In addition to the above experiments, the teacher may add more programs on the behalf of the theory syllabus.

SEMESTER I & II
B. SC. PHYSICAL SCIENCE
(COMPUTER APPLICATIONS)

CCaL-104
Core Course-I
COMPUTER FUNDAMENTALS AND OPERATING SYSTEM
(Credits: 02, 30 Hrs (2Hrs /week))

Marks for Major Test (External): 80

Marks for Internal Exam: 20

Time: 3 Hours

Paper setter is required to set nine questions in all. Question no. 1 is compulsory and is based on the entire syllabus consisting of eight to ten short answer type questions each of 2 marks. The remaining eight questions are to be set uniformly having two questions from each unit. The student is required to attempt five questions in all selecting one question from each unit and Question No. 1 is compulsory.

UNIT - I

Introduction: Characteristics, evolution and generations of computers, Basic Computer Organization: Input and Output Unit, Primary and Secondary storage, CPU: ALU, Control Unit, Classification of computers, Number Systems: Binary, Hexadecimal, Octal, Decimal numbers, Floating-point Numbers, Computer codes: BCD and EBCDIC codes, ASCII, Unicode.

UNIT - II

Input/Output & Storage Units:- Keyboard, Mouse, Trackball, Joystick, Digitizing tablet, Scanners, Digital Camera, MICR, OCR, OMR, Bar-code Reader, Voice Recognition, Light pen, Touch Screen, Monitors – characteristics and types of monitor -Digital, Analog, Size, Resolution, Refresh Rate, Interlaced / Non Interlaced, Printers& types – Daisy wheel, Dot Matrix, Inkjet, Laser, Line Printer, Plotter, Sound Card and Speakers

UNIT – III

Memories: Memory speed, access time, wait states, Types of memory, Dynamic and Static RAM, memory chip making, Cache memory, shadow RAM, ROM chips, Reading memory error messages, adding RAM, CPU Registers Storage fundamentals - Secondary Data Storage and Retrieval methods - Sequential, Direct and Index Sequential, Various Storage Devices Magnetic Tape, Magnetic Disks, Cartridge Tape, Hard Disk Drives, Floppy Disks, CD/DVD flash drives Video Disk , Blue Ray Disc

UNIT - IV

Windows OS: Operating system definition and evolution, Types of Operating Systems, Functions of operating systems, Popular Operating Systems, Features of Windows OS, Windows history;Files & Folders operations. Desktop, Recycle Bin, My Computer, My Documents, Windows Explorer, Configuring System Devices: Control Panel, Accessories in Windows.

TEXT BOOKS

1. PC Hardware Complete Reference - Craig Zacker & John Rourke, Tata McGraw Hill
2. Inside the PC - Peter Norton, BPB.
3. Foundation of Computing, Sinha P., Sinha P., BPB Publication

REFERENCES BOOKS

1. The Indispensable PC Hardware Book - Messmer, Pearson Education
2. Troubleshooting and Repairing Your PC - Corey Candler, Wiley
3. Upgrading and repairing PC's - Scott Mueller, Pearson Educati

CCaL 105
Core Course-II
Office Automation Tools
(Credits: 02, 30 Hrs (2Hrs/week))

Marks for Major Test (External): 80

Marks for Internal Exam: 20

Time: 3 Hours

Paper setter is required to set nine questions in all. Question no. 1 is compulsory and is based on the entire syllabus consisting of eight to ten short answer type questions each of 2 marks. The remaining eight questions are to be set uniformly having two questions from each unit. The student is required to attempt five questions in all selecting one question from each unit and Question No. 1 is compulsory.

UNIT – I

MS PowerPoint: Introduction & area of use; Creating a New Presentation; Working with Presentation; Using Wizards; Slides & its different views; Inserting, Deleting and Copying of Slides; Working with Notes, Handouts, Columns & Lists; Adding Graphics, Sounds and Movies to a Slide; Working with PowerPoint Objects; Designing & Presentation of a Slide Show; Printing Presentations, Notes, Handouts with print options. Animations and Sounds, Inserting Animated Pictures or Accessing through Object, Inserting Recorded Sound Effect or In-Built Sound Effect. Outlook Express: Features and uses, Configuring and using Outlook Express for accessing e-mails in office.

UNIT-II

MS Word: Introduction area of use, Menus & Commands; Toolbars & Buttons; Shortcut Menus, Wizards & Templates; Creating a New Document; Different Page Views and layouts; Applying various Text Enhancements; Working with – Styles, Text Attributes; Paragraph and Page Formatting; Text Editing using various features ; Bullets, Numbering, Auto formatting, Printing. Spell Check, Thesaurus, Find & Replace; Headers & Footers ; Inserting – Page Numbers, Pictures, Files, Autotexts, Symbols etc.; Working with Columns, Tabs & Indents; Creation & Working with Tables; Margins & Space management in Document; Adding References and Graphics; Mail Merge, Envelops & Mailing Labels. Importing and exporting to and from various formats.

UNIT – III

Excel: Creating & Saving work book. Structure of Worksheet, entering & editing data, Copying & Moving data, Finding & Replacing data. Filling Data. Sorting data. Formatting Data – Number Style Format, Border & Color, Rotating Texts, Conditional Formatting. Arranging Multiple Workbooks or Windows, Hiding & Unhiding – workbooks, worksheets, rows & columns. Inserting Columns & Rows. Adjusting widths & Heights of Columns & Rows. Copying, moving, inserting, deleting & renaming worksheets in workbooks. Defining, Inserting & deleting Cell or Range Names.

UNIT – IV

Formulas & Functions: Mathematical operators. Creating, changing & copying formulas. Absolute referencing. Functions – Log, Sum, Average, Count, If, Max, Sum If. Date & Time, Database, Text, Maths & Statistical functions. Charts in Excel: Types of charts, Inserting & Modifying charts. File & Print Operations. Linking Worksheets & Workbooks. Creating lists, Using Filters & Subtotals. Recording, running and editing Macros. Data Validation. What-if analysis using Goal seek and scenarios.

TEXT BOOKS

1. Microsoft Office – Complete Reference – BPB Publication
2. Learn Microsoft Office – Russell A. Stultz – BPB Publication

REFERENCES BOOKS

1. Courter, G Marquis. Microsoft Office 2000: Professional Edition. BPB.
2. Koers, D . Microsoft Office XP Fast and Easy. PHI.
3. Nelson, S L and Kelly, J . Office XP: The Complete Reference. Tata McGraw-Hill.

CCaP-109
Practical-I: Computer Lab--1
(Credits: 02, 60 Hours (4hrs. per week))

Marks: 50
Time: 4 Hours

List of Experiments:

Section-A

1. Create an admission form in MS-Word. You need to use Text-Boxes, Shapes, Colors, formatting options, table and horizontal lines.
2. Send a birthday invitation to your 100 friends using Mail-Merge.
3. Study and use various functions like Sum, Average, Maximum, and Minimum in MSExcel.
4. Fill 50 students' records in MS-Excel sheet1. The fields must be Roll No., Name, Father Name, Course Joined, Marks obtained in three subjects. Create a marks-sheet in sheet2.
5. Create 10 slides in MS-PowerPoint related to internet advantages and disadvantages in daily life. Add animations to these all slides.

Note: In addition to the above experiments, the teacher may add more programs on the behalf of the theory syllabus.

CCaL-204
Core Course-I
INFORMATION TECHNOLOGY
(Credits: 02, 30 Hrs (2Hrs /week))

Marks for Major Test (External): 80
Marks for Internal Exam: 20
Time: 3 Hours

Paper setter is required to set nine questions in all. Question no. 1 is compulsory and is based on the entire syllabus consisting of eight to ten short answer type questions each of 2 marks. The remaining eight questions are to be set uniformly having two questions from each unit. The student is required to attempt five questions in all selecting one question from each unit and Question No. 1 is compulsory.

UNIT – I

Information Technology Basics, Role of IT. PC evolution, PC classifications, Introduction to Microprocessors.

Inside the PC system unit: PC system unit layout; Motherboard, Memory, Expansion slots and Adapter cards, SMPS, Display unit, Keyboard, Rear side connectors, System Buses, Local Buses

Communication with peripherals: Serial ports, Parallel port, Game Port, USB Port, Fire-Wire Port, HDMI Port, Upgrading PC for Multimedia.

UNIT – II

Information Tools for management control: Decision Support System, Executive Information System, Geographical Information System, On-Line Analytical processing, Data Warehousing, Data Mining, Web advertising, Presentations, Electronic Catalogues

Computer Security: Introduction, Malicious Programs, Digital Signature, Firewall, User Identification and Authentication.

UNIT – III

Emerging Trends in IT: E-Commerce, Electronic Data Interchange(EDI), Mobile Communication, Bluetooth, Global Positioning System(GPS), Smart Cards Multimedia: Definition and building blocks, Hardware, Software and Applications, Multimedia presentation devices, Virtual Reality Digital Sound data: MIDI, Data Compression.

UNIT – IV

Data communications and Computer Networks: Basic Components, Transmission media, Switching, Multiplexing, Modulation, Network Technologies, network types, Communication Protocols, Wireless networks, The Internet: History, Basic services, WWW, browsers, Service

providers, Internet naming and addressing - Electronic mail, Remote login, File Transfer, Search Engine, Getting connected to the Internet.

TEXT BOOKS

1. Sinha P., Sinha P., “Foundations of Computing”, BPB Publication
2. Brain, K. Williams et. al., Using Information Technology, TMH.

REFERENCE BOOKS

1. Turban, Rainer, Potter, Introduction to Information Technology, second edition, Wiley Publications.
2. Dennis P. Curtin, et. al., Information Technology - The Breaking View, TMH.
3. Rajaraman V., “Computer Fundamentals”

CCaL-205
Core Course-IV
PROGRAMMING IN 'C'
(Credits: 02, 30 Hrs (2Hrs /week))

Marks for Major Test (External): 80

Marks for Internal Exam: 20

Time: 3 Hours

Paper setter is required to set nine questions in all. Question no. 1 is compulsory and is based on the entire syllabus consisting of eight to ten short answer type questions each of 2 marks. The remaining eight questions are to be set uniformly having two questions from each unit. The student is required to attempt five questions in all selecting one question from each unit and Question No. 1 is compulsory.

UNIT-I

Planning the Computer Program: Concept of problem solving, Problem definition, Program design, Debugging, Types of errors in programming, Documentation.

Techniques of Problem Solving: Flowcharting, algorithms, pseudo code, decision table, Structured programming concepts, Programming methodologies viz. top-down and bottom-up programming.

Searching, Sorting, and Merging: Linear & Binary Searching, Bubble, Selection, and Insertion Sorting, Merging.

UNIT-II

Structure of a C Program, C character set, identifiers and keywords, Data types, Constants and Variables, Assignment statement, Symbolic constant. Input/output: Unformatted & formatted I/O function.

Operators & Expression: Arithmetic, relational, logical, bitwise, unary, assignment, conditional operators and special operators. Arithmetic expressions, evaluation of arithmetic expression, type casting and conversion, operator hierarchy & associativity.

UNIT-III

Control statement in C: Branching - Decision making with IF statement, IF-ELSE statement, Nested IF statement, ELSE-IF ladder, switches statement, go to statement. Looping: For, while, and do-while loop, jumps in loops, break, continue statement.

UNIT-IV

Functions: Definition, prototype, passing parameters, recursion. Storage classes in C: auto, extern, register and static storage class, their scope, storage, & lifetime.

Arrays: Definition, types, initialization, processing an array

TEXT BOOKS

1. Sinha, P.K. & Sinha, Priti, Computer Fundamentals, BPB
2. Balagurusamy, E., Programming in ANSI C, Tata McGraw-Hill

REFERENCE BOOKS

1. Dromey, R.G., How to Solve it By Computer, PHI
2. Gottfried, Byron S., Programming with C, Tata McGraw Hill
3. Norton, Peter, Introduction to Computer, McGraw-Hill
4. Leon, Alexis & Leon, Mathews, Introduction to Computers, Leon Tech World
5. Rajaraman, V., Fundamentals of Computers, PHI

CCaP-209 Practical-II: Computer Lab--11
(Credits: 02, 60 Hrs (4Hrs /week))

Marks: 50
Time: 4 Hours

List of Experiments:

1. Program to convert a given decimal number into its binary equivalent using bitwise operators.
2. Program to accept a positive integer and find the sum of the digits in it.
3. Find The Roots of Quadratic Equation using if else statement.
4. Program to generate prime numbers.
5. Program to multiply two matrices.
6. Program to find GCD and LCM using non-recursive function.
7. Program to generate terms of Fibonacci series using recursive function.
8. Program to read a string and check whether it is a palindrome or not (using library functions).

Note: In addition to the above experiments, the teacher may add more programs on the behalf of the theory syllabus.

SEMESTER I & II
B. SC. PHYSICAL SCIENCES
(MATHEMATICS)

CML 106
Core Course-I
ALGEBRA
(Credits: 04; 60 Hrs (4Hrs /week)))

Marks for Major Test (External): 80

Marks for Internal Exam: 20

Time: 3 Hours

The examiner is requested to set nine questions in all, selecting two questions from each Unit. Question no. 1 is compulsory and is based on entire syllabus consisting of eight to ten short answer type questions each of 2 marks. Candidates are required to attempt five questions in all, selecting one question from each Unit and Question no. 1 is compulsory wherein student is required to attempt 8 parts.

Course Objective	Course Outcome
The course on Algebra deals with advance topics on matrices viz. rank, eigen values and homogeneous and non homogeneous systems, solution of cubic and bi-quadratic equations and DeMoivre's theorem.	The student will be able to find the rank, eigen values of matrices and solve the homogeneous and non homogeneous systems, solution of cubic and bi-quadratic equations.

Unit-I

Matrices, Symmetric, Skew-Symmetric, Hermitian and Skew-Hermitian matrices. Rank of a matrix. Linear dependence and independence of rows and columns of matrices. Row Equivalent matrices and column equivalent Matrices, Reduction to a Row and Column Mtrices, Normal form of a Matrix, Row rank and column rank of a matrix. Eigen values, eigen vectors and the characteristic equations of a matrix.

Unit-II

Minimal polynomial of a matrix. Cayley Hamilton theorem. Applications of matrices to a system of linear (both homogeneous and non-homogenous) equations. Theorems of consistency of a system of linear equations. Unitary and Orthogonal Matrices, Bilinear Form and Quadratic Form.

Unit-III

Descartes' Rule of Signs, Relations between the roots and coefficients of general polynomial equation in one variable. Solutions of polynomial equations having conditions on roots. Common roots and multiple roots. Transformation of equations into equations with roots multiplied by a given number, Equation with Reciprocal Roots, Roots Diminished by a given number.

Unit-IV

Solutions of cubic equations by Cardan's method, Descartes' Method and Ferrari's Method. Biquadratic equations and their solutions. De Moivre's theorem. Its applications in solutions of polynomial equations, Finding the n^{th} root of a number.

Books Recommended :

1. H.S. Hall and S.R. Knight : Higher Algebra, H.M. Publications 1994.
2. Shanti Narayan : A Text Books of Matrices.
3. Chandrika Prasad : Text Book on Algebra and Theory of Equations.
Pothishala Private Ltd., Allahabad.

CML 107
Core Course -II
CALCULUS
(Credits: 04; 60 Hrs (4Hrs /week)))

Marks for Major Test (External): 80

Marks for Internal Exam: 20

Time: 3 Hours

The examiner is requested to set nine questions in all, selecting two questions from each Unit. Question no. 1 is compulsory and is based on entire syllabus consisting of eight to ten short answer type questions each of 2 marks. Candidates are required to attempt five questions in all, selecting one question from each Unit and Question no. 1 is compulsory wherein student is required to attempt 8 parts.

Course Objective	Course Outcome
The course on differential Calculus deals with some important concepts of limit, continuity, differentiability of functions and tracing of curves.	The student will be able to understand basic properties of Limit, continuity and derivability of functions, series expansion indeterminate forms, tracing of curves with the help of asymptotes and singular points..

Unit-I

Limit, continuity (– definition), Types of Discontinuities and differentiability of functions. Successive differentiation of functions in implicit, explicit and parametric form. Leibnitz theorem. Some general theorems on differentiable functions and expansions. Taylor's theorem with Lagrange's form and Cauchy's form of remainder after 'n' terms. Maclaurin form and Infinite Series.

Unit-II

Asymptotes parallel to coordinate axis and Oblique Asymptotes in Cartesian and Polar form. Singular points. Points of inflexion. Multiple points. Cusps, nodes & conjugate points. Tracing of curves in Cartesian, parametric and polar co-ordinates, particularly, Asteroid, Cycloid and Cardoid.

Curvature (radius of curvature for Cartesian curve, parametric curves, polar curves, pedal curves)..

Unit-III

Reduction formulae. Rectification, length of curves in Cartesian, parametric and polar curves particularly Asteroid, Cycloid and Cardoid., intrinsic equations of curve.

Unit-IV

Quadrature (area) Sectorial area. Area bounded by closed curves in Cartesian, parametric form and polar form. Volumes and surfaces of solids of revolution about x-axis and about any line.

Books Recommended

1. H. Anton, I. Birens and S. Davis, Calculus, John Wiley and Sons, Inc., 2002.
2. G.B. Thomas and R.L. Finney, Calculus, Pearson Education, 2007.
3. George B. Thomas, Jr., Ross L. Finney : Calculus and Analytic Geometry, Pearson Education (Singapore); 2001.
4. T.M. Apostol : Calculus, vol. 1, John Wiley and Sons (Asia) : 2002.
5. A.I. Kostrikin: Introduction to Algebra, Springer Verlag, 1984.
6. Differential and Integral Calculus : Shanti Narayan.
7. . Murray R. Spiegel : Theory and Problems of Advanced Calculus. Schaun's Outline series. Schaum Publishing Co., New York.
8. N. Piskunov : Differential and integral Calculus. Peace Publishers, Moscow.
9. GorakhPrasad : Differential Calculus. Pothishasla Pvt. Ltd., Allahabad.

CMP 110
PRACTICAL-I
Mathematics Lab– I
(Credits: 1.5; 45 Hrs (3Hrs /week)))

Marks for Major Test (External): 50

Time: 3 Hours

Course Objective	Course Outcome
The course on Practical deals with some important concepts of Programming in C.	The student will be able to solve and calculate the mathematical problems through programming.

Part A: Introduction to Programming in C

Data types, Operators and expressions, Input / outputs functions. Decisions control structure: Decision statements, Logical and conditional statements, Implementation of Loops-for, while, do while; Switch Statement & Case control structures.

Part B:

Following Program should be done as Practical:-

1. Program to interchange the value of two variables.
2. Program to calculate compound interest.
3. Program for testing a leap year.
4. Program to find greatest of three numbers.
5. Program to calculate Gross salary of an employee.
6. Program to prepare electricity Bill.
7. Program to find roots of a quadratic equation.
8. Program to provide output of a given function.
9. Program to display table of an input number
10. Program to find reverse of a number
11. Program to generate Fibonacci series.
12. Program to check whether number is prime or not.
13. Program to generate first n prime numbers.
14. Program to check a number is Armstrong or not.
15. Program to convert a number to its binary equivalent.

Books Recommended:

1. B.W. Kernighan and D.M. Ritchie : The C Programming Language, 2nd Edition
2. V. Rajaraman : Programming in C, Prentice Hall of India, 1994
3. Byron S. Gottfried : Theory and Problems of Programming with C, Tata McGraw-Hill Publishing Co. Ltd., 1998

4. M.K. Jain, S.R.K. Lyengar, R.K. Jain : Numerical Method, Problems and Solutions, New Age International (P) Ltd., 1996
5. M.K. Jain, S.R.K. Lyengar, R.K. Jain : Numerical Method for Scientific and Engineering Computation, New Age International (P) Ltd., 1999
6. Computer Oriented Numerical Methods, Prentice Hall of India Pvt. Ltd.
7. Programming in ANSI C, E. Balagurusamy, Tata McGraw-Hill Publishing Co.Ltd.

CML 206
Core Course – III
VECTOR CALCULUS AND GEOMETRY
(Credits: 04; 60 Hrs (4Hrs /week)))

Marks for Major Test (External): 80

Marks for Internal Exam: 20

Time: 3 Hours

The examiner is requested to set nine questions in all, selecting two questions from each Unit. Question no. 1 is compulsory and is based on entire syllabus consisting of eight to ten short answer type questions each of 2 marks. Candidates are required to attempt five questions in all, selecting one question from each Unit and Question no. 1 is compulsory wherein student is required to attempt 8 parts.

Course Objective	Course Outcome
The course on Vector Calculus and Geometry deals with topics on vectors and geometry viz. directional derivatives, gradient, curl, two and three dimensional geometry.	The student will be able to find directional derivatives, gradient, curl. Laplacian operator, two and three dimensional geometry.

Unit – I

Scalar and vector product of three vectors, product of four vectors. Reciprocal vectors. Vector differentiation Scalar Valued point functions, vector valued point functions, derivative along a curve, directional derivatives. Gradient of a scalar point function, geometrical interpretation of grad. Divergence and curl of vector point function.

Unit – II

Gradient, divergence and curl of sums and product and their related vector identities. Laplacian operator. Orthogonal curvilinear coordinates Conditions for orthogonality fundamental triad of mutually orthogonal unit vectors. Gradient, Divergence, Curl and Laplacian operators in terms of orthogonal curvilinear coordinates, Cylindrical co-ordinates and Spherical co-ordinates.

Unit – III

Vector integration: Indefinite Integral, Definite Integral, Standard results of Integration. Line integral, Surface integral, Volume integral. Gauss Divergence Theorem, Divergence Theorem in Cartesian Co-ordinates, Green Theorem, Stoke's Theorem (Relation between line Integral and Surface Integral). Stoke's Theorem in Cartesian form. Green's Theorem in Plane as special case of Stoke's Theorem, problems based on these theorems.

Unit -IV

Geometry:General equation of second degree. Tracing of conics.Tangent at any point to the conic, chord of contact, pole of line to the conic, director circle of conic.Polar equation of a conic, tangent and normal to the conic.Sphere: Plane section of a sphere. Sphere through a given circle. Intersection of two spheres, Cones. Right circular cone.Cylinder: Right circular cylinder.

Books Recommended:

1. Murraray R. Spiegel : Theory and Problems of Advanced Calculus, Schaum Publishing Company, New York.
2. Murraray R. Spiegel : Vector Analysis, SchaumPublisghing Company, New York.
3. N. Saran and S.N. Nigam. Introduction to Vector Analysis, Pothishala Pvt. Ltd., Allahabad.
4. Shanti Narayna : A Text Book of Vector Calculus. S. Chand & Co., New Delhi.

CML 207
Core Course – IV
ORDINARY DIFFERENTIAL EQUATIONS AND LAPLACE TRANSFORMS
(Credits: 04; 60 Hrs (4Hrs /week)))

Marks for Major Test (External): 80

Marks for Internal Exam: 20

Time: 3 Hours

The examiner is requested to set nine questions in all, selecting two questions from each Unit. Question no. 1 is compulsory and is based on entire syllabus consisting of eight to ten short answer type questions each of 2 marks. Candidates are required to attempt five questions in all, selecting one question from each Unit and Question no. 1 is compulsory wherein student is required to attempt 8 parts.

Course Objective	Course Outcome
The course on ordinary differential equations and Laplace Transforms deals with some important concepts: Exact differential equations, Orthogonal trajectories, Linear differential equations with variable & constant coefficients and solution of ordinary differential equations using Laplace Transforms.	The student will be able to understand basic properties of differential equations, Orthogonal trajectories, Linear differential equations. Apart from this the students will be able to solve ODE by Transformation of the equation by changing the dependent variable/ the independent variable. Solution by operators of non-homogeneous linear differential equations. Reduction of order of a differential equation. Method of variations of parameters. Solution of Simultaneous Differential Equations and Total Differential Equations. Student will also be able to understand basic properties of Laplace and Inverse Laplace Transforms and solution of ordinary differential equations using Laplace Transform

Unit – I

Geometrical meaning of a differential equation. Exact differential equations, integrating factors. First order higher degree equations solvable for x, y, p Lagrange's equations, Clairaut's equations. Equation reducible to Clairaut's form. Singular solutions.

Unit – II

Orthogonal trajectories: in Cartesian coordinates and Polar coordinates. Self orthogonal family of curves. Linear differential equations with constant coefficients. Homogeneous linear ordinary differential equations. Equations reducible to homogeneous.

Unit – III

Linear differential equations of second order.Reduction to normal form.Transformation of the equation by changing the dependent variable/ the independent variable.Solution by operators of non-homogeneous linear differential equations.Reduction of order of a differential equation.Method of variations of parameters.Ordinary simultaneous differential equations.Solution of simultaneous differential equations.

Unit – IV

Laplace Transforms –Existence theorem for Laplace transforms, Linearity of the Laplace transforms, Shifting theorems, Laplace transforms of derivatives and integrals, Differentiation and integration of Laplace transforms, Convolution theorem, Inverse Laplace transforms, convolution theorem, Inverse Laplace transforms of derivatives,solution of ordinary differential equations using Laplace transform.

Books Recommended :

1. D.A. Murray : Introductory Course in Differential Equations. Orient Longaman (India) . 1967
2. A.R.Forsyth : A Treatise on Differential Equations, Machmillan and Co. Ltd. London
3. E.A. Codington : Introduction to Differential Equations.
4. S.L.Ross: Differential Equations, John Wiley & Sons
5. B.Rai& D.P. Chaudhary : Ordinary Differential Equations; Narosa, Publishing House Pvt. Ltd.
6. M.D. Raisinghanian :Ordinary and Partial Differential Equations.
7. Dyke,Phil : An introduction to Laplace Transforms and Fourier Series,Springer Undergraduate Mathematics Series.

CMP 210
PRACTIAL-II : Mathematics Lab – II
(Credits: 1.5; 45 Hrs (3Hrs /week))

Marks for Major Test (External): 50

Time: 3 Hours

Course Objective	Course Outcome
The course on Practical deals with some important concepts of vectors geometry and ODE.	The student will be able to solve and calculate the mathematical problems through programming.

Part A: Introduction to Programming in C

Strings: Character data type, Standard string handling functions, arithmetic operations on characters. Structures: definition, using structures, use of structures in arrays and arrays in structures, Functions.

Part B:

Following Program should be done as Practical:-

16. Program to add two matrices.
17. Program to multiply two matrices.
18. Program to find the inverse of a matrix.
19. Program to find transpose of a matrix.
20. Program to find the sum of a series.
21. Program to sort an entire array using bubble sort.
22. Program to find trace of 3X3 Matrix.
23. Program to find largest of three numbers using function.
24. Program to find factorial of a number using recursion.
25. Program to generate n Fibonacci terms using recursion.
26. Program to count number of vowels and consonants in a given sentence.
27. Program to print a salary chart for employee of a company.

Books Recommended:

1. B.W. Kernighan and D.M. Ritchie : The C Programming Language, 2nd Edition
2. V. Rajaraman : Programming in C, Prentice Hall of India, 1994
3. Byron S. Gottfried : Theory and Problems of Programming with C, Tata McGraw-Hill Publishing Co. Ltd., 1998

4. M.K. Jain, S.R.K. Lyengar, R.K. Jain : Numerical Method, Problems and Solutions, New Age International (P) Ltd., 1996
5. M.K. Jain, S.R.K. Lyengar, R.K. Jain : Numerical Method for Scientific and Engineering Computation, New Age International (P) Ltd., 1999
6. Computer Oriented Numerical Methods, Prentice Hall of India Pvt. Ltd.
7. Programming in ANSI C, E. Balagurusamy, Tata McGraw-Hill Publishing Co.Ltd.

SEMESTER I & II
B. SC. PHYSICAL SCIENCES
AWARENESS PROGRAM COMPULSARY COURSE
(ENVIRONMENTAL STUDIES)

CYL-201
Awareness Program Compulsory Course
ENVIRONMENTAL STUDIES
(Credits: 02; 30 Hrs (2Hrs /week))

Marks for Major Test (External): 80

Marks for Internal Exam: 20

Time: 3 Hours

Paper setter is required to set nine questions in all. Question no. 1 is Compulsory and is based on the entire syllabus consisting of eight to ten short answer type questions each of 2 marks. The remaining eight questions is to be set uniformly having two questions from each unit. The student is required to attempt five questions in all selecting one question from each unit and Question no. 1 is Compulsory wherein student is required to attempt 8 parts.

UNIT – I

The Multidisciplinary nature of environmental studies Definition, scope and importance, Need for public awareness. Natural resources: Renewable and non-renewable resources Natural resources and associated problems. a) Forest resources: Use and over-exploitation, deforestation b) Water resources: Use and over-utilization of surface and ground water, floods and drought. c) Mineral resources: Use and exploitation, environmental effects of extruding. d) Food resources: World food problems, changes caused by agriculture, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity. e) Energy Resources: Growing energy needs, renewable and non renewable energy sources use of alternative energy sources. f) Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification

Unit-II

Ecosystems Concept of an ecosystem, Structure and function of an ecosystem, Procedures, consumers and decomposers, Energy flow in the ecosystem, Ecological succession & Food chains, food webs and ecological pyramids. Biodiversity and its conservation: Introduction – Definition: genetic, species and ecosystem diversity, Biogeographical classification of India, Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values, Biodiversity at global, National and local levels, India as a megadiversity nation.

Unit-III

Environmental Pollution Definition, Causes, effects and control measures of: - Air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution & Nuclear hazards. Solid waste Management: Causes, effects and control measures of urban and industrial wastes.

Unit-IV

Social Issues and the Environment From Unsustainable to sustainable development, urban problems related to energy, Water conservation, rain water harvesting, watershed management, Resettlement and rehabilitation of people- its problems and concerns. Environmental ethics: Issues and possible solutions, Climate change, global warming, acid rain, 7 ozone layer depletion, nuclear accidents and holocaust, Wasteland reclamation, Consumerism and waste products, environment Protection Act, Air (Prevention and Control of Pollution) Act, Water(Prevention and control of Pollution) Act, Wildlife Protection Act, Forest Conservation Act, Issues involved in enforcement of environment legislation & Public awareness.

Reference books:

1. De A. K. Environmental Chemistry, Wiley Eastern Ltd, 1999.
2. Bharucha E. Text book of Environmental studies, University press, Hyderabad 2005.
3. Cunningham W P., Cooper T H. Gorhani E. Hepworth M T, Environmental Encyclopedia, Jaico publication House, Mumbai, 2001.
4. Miller T G. Environmental Science Wadsworth publishing corp, 2000.

CHOICE BASED CREDIT SYSTEM

(CBCS)

Guru Jambheshwar University of Science and Technology, Hisar

Scheme and Syllabi
for
(Third & Fourth Semesters)

Undergraduate Course:

B. SC. PHYSICAL SCIENCES

**(PHYSICS/GEOGRAPHY, CHEMISTRY/
ELECTRONICS/ COMPUTER SCIENCE/ COMPUTER
APPLICATIONS, MATHEMATICS)**

Under
The Faculty of Physical Sciences and Technology



w.e.f. Academic Session 2018-19

SEMESTER III & IV
B. SC. PHYSICAL SCIENCES
LANGUAGE SKILLS COMPULSARY COURSE
(HINDI COMPULSORY)

CXL-301(i)
Language Skills Compulsory Course-III
CXL-401(i)
Language Skills Compulsory Course-IV

***FOR SYLLABUS OF HINDI SUBJECT, SEE SEPARATE FILE
ON WEBSITE***

SEMESTER III & IV
B. SC. PHYSICAL SCIENCES
LANGUAGE SKILLS COMPULSARY COURSE
(SANSKRIT COMPULSORY)

CXL-301(ii)
Language Skills Compulsory Course-III
CXL-401(ii)
Language Skills Compulsory Course-IV

***FOR SYLLABUS OF SUNSKRIT SUBJECT, SEE SEPARATE
FILE ON WEBSITE***

SEMESTER III & IV
B. SC. PHYSICAL SCIENCES
(PHYSICS)

CPL-302
Core Course-V
Heat and Thermodynamics
(Credits – 02, 30 Hrs (2 Hrs/week))

Marks for Major test (External): 80

Marks for internal Exam : 20

Time: 3 Hours

Paper setter is required to set nine questions in all. Question no. 1 is Compulsory and is based on the entire syllabus consisting of eight short answer type questions each of 2 marks. The remaining eight questions is to be set uniformly having two questions from each unit. The student is required to attempt five questions in all selecting one question from each unit and Question no. 1 is Compulsory, The paper will include at least 20% of total marks as numerical problems.

Course Objective	Course Outcome
The course on Thermal physics deals with some important laws of thermodynamics, concepts of heat, work, temperature and entropy. Behavior of real gases as thermodynamical systems will be of interest.	The student will be able to understand basic concepts of thermodynamical systems.

Unit- I

Zeroth and First Law of Thermodynamics: Extensive and intensive thermodynamic variables, Thermodynamic equilibrium, Zeroth law and Concept of Temperature, Work and heat, State functions, First law of thermodynamics, Internal energy, Applications of first law, General relation between C_p and C_v , Work done during isothermal and adiabatic Processes .

Second Law of Thermodynamics: Reversible and Irreversible process with examples, Conversion of Work into Heat and Heat into Work, Heat Engines, Carnot's Cycle, Carnot engine & efficiency, Refrigerator & coefficient of performance, 2nd Law of Thermodynamics: Kelvin-Planck and Clausius Statements and their Equivalence, Carnot's Theorem

UNIT-II

Entropy and Third law of Thermodynamics: Concept of entropy, Clausius theorem, Clausius Inequality, Second Law of Thermodynamics in terms of Entropy, Entropy of a Perfect Gas and Universe, Entropy Changes in Reversible and Irreversible Processes, Principle of Increase of Entropy, Third Law of Thermodynamics, T-S Diagrams, Phase Change, Classification of Phase Changes.

UNIT-III

Thermodynamic Potentials :- Extensive and Intensive Thermodynamic Variables, Internal Energy, Enthalpy, Gibbs, Helmholtz function and Their Definitions, Properties and Applications.

Maxwell's Thermodynamic Relations: - Derivations of Maxwell's Relations. Applications of Maxwell's Relations: (1) Clausius-Clapeyron equation, (2) Values of $C_p - C_v$, (3) Energy equations (4) Change of temperature during adiabatic process.

UNIT-IV

Real gases: - Behaviour of Real Gases, Deviations from the Ideal Gas Equation. The Virial Equation, Critical Constants. Continuity of Liquid and Gaseous State. Vapour and Gas, Boyle Temperature, Van der Waal's Equation of State for Real Gases. Values of Critical Constants. Law of Corresponding States. Comparison with Experimental Curves, p-V Diagrams, Joule's Experiment, Free Adiabatic Expansion of a Perfect Gas.

Reference Books:

- Thermal Physics by Garg, Bansal and Ghosh (Tata McGraw-Hill, 1993)
- Concepts in Thermal Physics, S. J. Blundell and K. M. Blundell, Oxford University Press
- Heat and Thermodynamics: An Intermediate Textbook By Mark Waldo Zemansky, Richard Dittman (McGraw-Hill, 1981)

CPL-303
Core Course –VI
Semiconductor Devices
(Credits – 02, 30 Hrs (2 Hrs/week))

Marks for Major test (External): 80

Marks for internal Exam : 20

Time: 3 Hours

Paper setter is required to set nine questions in all. Question no. 1 is Compulsory and is based on the entire syllabus consisting of eight short answer type questions each of 2 marks. The remaining eight questions is to be set uniformly having two questions from each unit. The student is required to attempt five questions in all selecting one question from each unit and Question no. 1 is Compulsory. The paper will include at least 20% of total marks as numerical problems.

Course Objective	Course Outcome
The course on Semiconductor Devices deals with basic semiconductor properties, band formation, intrinsic and extrinsic semiconductors and formation of junction. After discussing the transistor physics, applications of diodes and transistors in various devices are given.	The student will be able to understand the semiconductor junctions, transistors and various devices based on these basic semiconductor elements.

UNIT-I

Semiconductor Diodes and applications: p and n type semiconductors. Barrier Formation in PN Junction Diode, Drift and Diffusion Currents, Current flow mechanism in Forward and Reverse biased PN Junction Diodes mentioning the roles of drift and diffusion currents, V-I characteristics of PN Junction Diode, Static and Dynamic Resistance, Applications of PN Junction Diode as Half-wave rectifier, Full-wave Rectifier (both center-tapped and bridge FWR), Calculation of ripple factor and rectification efficiency, Zener Diode, Applications of Zener Diode as DC voltage Regulator, Principle and structure of (1) LEDs (2) Photodiode (3) Solar Cell.

UNIT-II

Semiconductor Transistors: Bipolar Junction transistors: n-p-n and p-n-p Transistors, Biasing of transistors in Active, Cutoff, and Saturation Modes, Circuit configurations of CB, CE and CC transistors, characteristics of transistors in CB, CE and CC, Current gains α and β . Relations between α and β , Current gain and power gain, DC Load line and Q- point

UNIT-III

Amplifiers and Their Biasing: Voltage Divider Bias Circuit for CE Amplifier, bias stabilization, Class-A, B&C amplifiers, RC coupled amplifiers and its frequency response, Feedback in amplifiers, positive and negative feedback in amplifiers, Advantages of negative feedback in amplifiers,

Sinusoidal Oscillators: Barkhausen's Criterion for Self-sustained oscillations, Circuit and working of Hartley oscillator, Circuit and working of Colpitt's oscillator, Uses of oscillator.

UNIT-IV

Operational Amplifiers (Black Box approach): Qualitative idea of differential amplifier, CMRR, Characteristics of an Ideal and Practical Op-Amp (IC 741), Open-loop & Closed-loop Gain. concept of Virtual ground, Applications of Op-Amps as Inverting Amplifier, Non-inverting Amplifier, Differentiator, Integrator.

Reference Books:

- Integrated Electronics, J. Millman and C.C. Halkias, 1991, Tata Mcgraw Hill.
- Electronic devices and circuits, S. Salivahanan and N. Suresh Kumar, 2012, Tata McGraw Hill.
- Microelectronic Circuits, M.H. Rashid, 2nd Edn., 2011, Cengage Learning.
- Modern Electronic Instrumentation & Measurement Tech., Helfrick & Cooper, 1990, PHI Learning
- Digital Principles & Applications, A.P. Malvino, D.P. Leach & Saha, 7th Ed., 2011, Tata McGraw Hill
- Fundamentals of Digital Circuits, A. Anand Kumar, 2nd Edition, 2009, PHI Learning Pvt. Ltd.
- OP-AMP and Linear Digital Circuits, R. A. Gayakwad, 2000, PHI Learning Pvt. Ltd.

CPP- 308
Practical -III; Physics Lab--III
Credits: 02, total 60 Hours (4hrs. per week)

Max. Marks: 100

Time: 3 Hours

Note:-

1. Do any Seven experiments.
2. The students are required to calculate the error involved in a particular experiment.
3. For giving marks under Lab. Record each college will maintain practical assessment record by using the following procedure:-
Each student has to perform a minimum number of experiments prescribed in the syllabus. After the completion of a practical the teacher concerned will check the note book and conduct the Viva- voce of each student to find out how much concepts related to the theoretical and experimental part of the experiment he/ she has understood. According to his/her performance marks will be recorded on their practical note-book. These marks will constitute the lab. Record.
4. To compute the final marks for lab. Record, a separate register will be maintained. Each student will be assigned separate page on this register. On this page the marks obtained by the student in different practicals will be entered. This record will be signed by the concerned teacher.
5. The laboratory Record register will be presented to the external practical examiners for Lab. Record marks. These external examiners may verify the record randomly.

List of Experiments

1. To measure the (a) area of a window (b) height of an inaccessible object by Sextent.
2. Refractive index and dispersive power of a prism material by spectrometer.
3. To draw a graph between wave length and minimum deviation for various lines from a Mercury discharge source.
4. Determination of wave length of Na light and the number of lines per centimeter using a diffraction grating.
5. To draw common base and common emitter characteristics of a transistor and calculate transistor characteristics parameters.
6. To study the ripple factor in a d.c. power supply.
7. Study of Hartley oscillator (calibration of gang condenser).
8. To measure (a) Voltage, and (b) Frequency of a periodic waveform using a CRO
9. To verify and design AND, OR, NOT and XOR gates using NAND gates

Extended list of experiments that may be added in above list (Experiments based on Computer programming in FORTRAN language.)

1. To print out all natural (even/odd) numbers between given limits using computer.
2. To find maximum, minimum and range of a given set of numbers using computer.
3. To evaluate sum of finite series.
4. Find the roots of a quadratic equation.

References:

1. Worshnop and Flint, Advanced Practical Physics
2. Nelkon M and Ogborn, Advanced Level Practical Physics, Heinemann Education Bookd Ltd, New Delhi
3. Srivastava S S and Gupta M K, Experiments in Electronics, Atma Ran & Sons, Delhi 4
- Gupta S L and Kumar V, Practical Physics, Pragati Prakashan, Meerut.

CXL-401

Semester IV

CPL-402

Core Course-VII

Statistical Mechanics

(Credits – 02, 30 Hrs (2 Hrs/week))

Marks for Major test (External): 80

Marks for internal Exam : 20

Time: 3 Hours

Paper setter is required to set nine questions in all. Question no. 1 is Compulsory and is based on the entire syllabus consisting of eight short answer type questions each of 2 marks. The remaining eight questions is to be set uniformly having two questions from each unit. The student is required to attempt five questions in all selecting one question from each unit and Question no. 1 is Compulsory, *The paper will include at least 20% of total marks as numerical problems.*

Course Objective	Course Outcome
The course on statistical mechanics deals with statistical description of macro system, density of states, concept of ensemble, partition function and kinetic theory of gases. The Maxwell-Boltzmann Distributions, Fermi-Dirac Distribution and Bose-Einstein distributions and their applications are given.	The student will be able to understand some basic notion of statistical mechanics including interpretation of second law of thermodynamics. Concept of negative temperature. Gibbs paradox.

UNIT-I

Statistical Basis of Thermodynamics: - Statistical Basis, Probability and Frequency, Permutations and Combinations, Distribution of n distinguishable and indistinguishable particles in two boxes, Macrostate and Microstate, Thermodynamic Probability, Fluctuations and their Dependence on n : (narrowing of probability distribution with increasing n), Constraints on a System, Static and dynamics system, most probable state, Concept of cell in a compartment, Concept of Ensembles and type of Ensembles (Qualitative Idea only)

Universal Law in Statistics: - Fundamental Postulates of Statistical Mechanics, Density of Quantum states of energy of a particle, Entropy and thermodynamics Probability, Statistical Interpretation of 2nd law of thermodynamics, Partition function and Relation with Thermodynamics Quantities

UNIT-II

Kinetic Theory of Gases: - Maxwell-Boltzmann Law of Distribution of Particle speed in an Ideal Gas and its Experimental Verification, Mean, RMS and Most Probable Speeds.

Molecular Collisions: - Mean Free Path. Collision Probability, Estimates of Mean Free Path, Transport Phenomenon in Ideal Gases: (1) Viscosity, (2) Thermal Conductivity (3) Diffusion. Brownian Motion and its Significance.

Equipartition Law: Degrees of Freedom, Law of Equipartition of Energy (No proof required) and its application to the specific heat of monoatomic and diatomic gases and its limitations.

UNIT-III

Classical Statistics: - Phase space and Application to One Dimension Harmonic Oscillator and Free particle, Division of phase space into cells, Basic approach in three statistics, Maxwell-Boltzmann Distribution Law, Thermodynamic Functions of Finite Number of Energy Levels, Negative Temperature, Thermodynamic Functions of an Ideal Gas, Classical Entropy Expression, Gibbs Paradox.

UNIT-IV

Bose-Einstein Statistics: - B.E. distribution law, Thermodynamic functions of a Completely Degenerate Bose Gas, Bose-Einstein condensation, properties of liquid He (qualitative description), Radiation as photon gas, Bose's derivation of Planck's law.

Fermi-Dirac Statistics: - Fermi-Dirac Distribution Law, Thermodynamic functions of an ideal Completely Degenerate, Fermi Gas, Fermi Energy, Electron gas in a Metal, Specific Heat of Metals, Comparison of three statistics M-B, B-E and F-D.

Suggested Books:

- Concepts in Thermal Physics, S. J. Blundell and K. M. Blundel, Oxford University Press
- Statistical Physics, Berkeley Physics Course Volume 5 by F Reif (Tata McGraw-Hill Company Ltd, 2008)
- Statistical and Thermal Physics: an introduction by S. Lokanathan and R.S. Gambhir. (P.H.I., 1991).
- Statistical Mechanics by R. K. Patharia. (Oxford: Butterworth, 1996).

CPL-403
Core Course-VIII
Waves and Optics
((Credits – 02, 30 Hrs (2 Hrs/week))
Marks for Major test (External): 80
Marks for internal Exam : 20
Time: 3 Hours

Paper setter is required to set nine questions in all. Question no. 1 is Compulsory and is based on the entire syllabus consisting of eight short answer type questions each of 2 marks. The remaining eight questions is to be set uniformly having two questions from each unit. The student is required to attempt five questions in all selecting one question from each unit and Question no. 1 is Compulsory, The paper will include at least 20% of total marks as numerical problems.

Course Objective	Course Outcome
The course on Waves and Optics deals with the wave equation, Interference, diffraction and polarization.	The student will be able to understand concepts of transverse and longitudinal waves, Young have double slit experiment. Concept of refractive index, Zone plate, various types of diffraction. Basic idea of the light propagation through optical fibers.

UNIT 1

Wave Motion: Wave Equation, Solution of wave equation, Particle and Wave Velocities, Intensity of Wave, Superposition Principle, Group velocity, Phase velocity

Transverse Waves: The string as a force oscillator, Velocity of Transverse Vibrations of Stretched Strings, Reflections and transmission of waves on a string at a boundary, Transverse waves on a string, Travelling and standing waves on a string, Normal Modes of a string, Reflections and transmission of Energy.

Longitudinal Waves: Velocity of Longitudinal Waves in a Fluid in a Pipe, Newton's Formula for Velocity of Sound, Laplace's Correction (qualitative), Reflections and transmission of sound waves at a boundary, Energy distribution in sound waves.

UNIT II

Interference: Division of amplitude and division of wave front, Young's Double Slit experiment, Lloyd's Mirror and Fresnel's Biprism, Phase change on reflection: Stokes' treatment, Interference in Thin Films: parallel and wedge-shaped films, Newton's Rings: measurement of wavelength and refractive index.

UNIT III

Diffraction: Fresnel Diffraction: Fresnel's Assumptions, Fresnel's Half-Period Zones for Plane Wave, Rectilinear Propagation of Light, Theory of a Zone Plate and its application, Multiple Foci of a Zone Plate, Qualitative description for Fresnel diffraction pattern of a straight edge, a slit and a wire.

Fraunhofer diffraction: Single slit, Double slit multiple slits and 'n' multiple slits, Diffraction grating and its resolving power, Rayleigh Criteria of the limit of resolution and Resolving Power of a telescope.

UNIT IV

Polarization: Plane polarized light – production and analysis, Circular and elliptical polarization, Optical activity, Specific Rotation

Fibre Optics: Optical Fibres - Construction and working, Critical angle of propagation, Modes of propagation, Acceptance angle, Attenuation. Advantages and applications of Optical Fibre

Reference Books

- Waves: Berkeley Physics Course, vol. 3, Francis Crawford, 2007, Tata McGraw-Hill.
- Fundamentals of Optics, F.A. Jenkins and H.E. White, 1981, McGraw-Hill
- Principles of Optics, Max Born and Emil Wolf, 7th Edn., 1999, Pergamon Press.
- Optics, Ajoy Ghatak, 2008, Tata McGraw Hill
- The Physics of Vibrations and Waves, H. J. Pain, 2013, John Wiley and Sons.
- The Physics of Waves and Oscillations, N.K. Bajaj, 1998, Tata McGraw Hill.
- Fundamental of Optics, A. Kumar, H.R. Gulati and D.R. Khanna, 2011, R. Chand Publications

CPP- 408
Practical -IV; Physics Lab--IV
Credits: 02, total 60 Hours (4hrs. per week)

Max. Marks: 100
Time: 3 Hours

Note:-

1. Do any Seven experiments.
2. The students are required to calculate the error involved in a particular experiment.
3. For giving marks under Lab. Record each college will maintain practical assessment record by using the following procedure:-
Each student has to perform a minimum number of experiments prescribed in the syllabus. After the completion of a practical the teacher concerned will check the note book and conduct the Viva- voce of each student to find out how much concepts related to the theoretical and experimental part of the experiment he/ she has understood. According to his/her performance marks will be recorded on their practical note-book. These marks will constitute the lab. Record.
4. To compute the final marks for lab. Record, a separate register will be maintained. Each student will be assigned separate page on this register. On this page the marks obtained by the student in different practicals will be entered. This record will be signed by the concerned teacher.
5. The laboratory Record register will be presented to the external practical examiners for Lab. Record marks. These external examiners may verify the record randomly.

List of Experiments

1. Wave length by Newton's Rings
2. Resolving power of a telescope.
3. Comparison of Illuminating Powers by a Photometer.
4. To find the equivalent focal length of a lens system by nodal slide assembly
5. Study of series and parallel resonance circuits.
6. Electronic Voltmeter measurement of peak, average & R.M.S. value of signal.
7. Study of voltage doubler and tripler circuits.
8. To determine value of Boltzmann constant using V-I characteristic of PN diode.
9. To determine the Frequency of an Electrically Maintained Tuning Fork by Melde's Experiment and to verify $\lambda^2 - T$ Law.

Extended list of experiments that may be added in above list (Experiments based on Computer programming in FORTRAN language.)

1. To find integration of a definite integral by trapezoidal rule.
2. To find the area of a triangle, sphere and cylinder.
3. Given values for a, b, c and d and a set of values for the variable x evaluate the function defined by. $f(x) = ax^2 + bx + c$ if $x < d$ $f(x) = 0$ if $x = d$ $f(x) = ax^2 + bx - c$ if $x > d$ For each value of x and print the value of x and f(x). Write a program for an arbitrary number of x values.

References:

- 1 Worsnop and Flint, Advanced Practical Physics
- 2 Nelkon M and Ogborn, Advanced Level Practical Physics, Heinemann Education Bookd Ltd, New Delhi
- 3 Srivastava S S and Gupta M K, Experiments in Electronics, Atma Ran & Sons, Delhi
- 4 Gupta S L and Kumar V, Practical Physics, Pragati Prakashan, Meerut.

CPS-409
Skill Enhancement Course-I (Physics)
Electrical Circuits and Network Skills
((Credits – 02, 30 Hrs (2 Hrs/week))
Marks for Major test (External): 50
Time: 2 Hours

Note:-

1. There are two UNITS and the paper is a mix of theory and practical/demonstration/project to understand the concepts of use of components and design of small circuits.
2. The students are required to design the circuits using bread boards and elementary electronic components.
3. Each student has to perform/ evolve a small project/device.
The teacher concerned will see the performance and conduct the Theory/Viva – voce of each student to find out how much concepts related to the theoretical and experimental part of the project, he/ she has understood. According to his/her performance marks will be recorded, in internal.

Course Objective	Course Outcome
The aim of this course is to enable the students to design and trouble shoots the electrical circuits, networks and applications through hands-on mode.	The student will be able to design the electrical and electronic circuits. This will enable the student to evolve small projects.

UNIT -I

Basic Electrical Components: Electronic components. Passive components. Resistors and their types. Color coding of resistors. Troubles in resistors. Capacitors and their types. Troubles in capacitors. Inductors and their types. Troubles in inductors. Internal resistance and impedance. Types of Electrical switches. “Single-pole Single-throw” (SPST) switch. “Single-pole Double-throw” (SPDT) switch. “Double-pole Double-throw” (DPDT) switch. Application of SPST , SPDT and DPDT switches.

Electrical Protection and Electrical Wiring: Relays. Fuses and disconnect switches. Circuit breakers. Overload devices. Ground-fault protection. Grounding and isolating. Construction and working of MCB & MCCB and their uses. Different types of conductors and cables. Basics of wiring - Star and delta connection. Voltage drop and losses across cables and conductors.. Insulation. Solid and stranded cable. Preparation of extension board.

UNIT-II

Electrical Energy Sources and Measurements: Real (practical) and ideal voltage source. Real (practical) current source. Conversion of voltage source into current source or vice-versa Maximum power transfer theorem. Thevenin theorem and norton’s theorem. Familiarization with multimeter. Voltmeter and ammeter. AC source -single phase and three phase alternating current sources. Measurement of energy consumption in AC circuits.

Digital Circuits: Difference between Analog and Digital Circuits, Binary Numbers, Decimal to Binary and Binary to Decimal Conversion, AND, OR and NOT Gates, Realization of AND, OR and NOT Gates using Diodes, resistances and Transistor, NAND and NOR Gates as Universal Gates, Realization of AND, OR and NOT Gates using NAND Gates only and NOR Gates only, XOR gates, XNOR Gates, De Morgan's Theorems, Boolean Laws.

Reference Books:

- A text book in Electrical Technology- B L Theraja – S Chand & Co.
- A text book of Electrical Technology - A K Theraja.

SEMESTER III & IV
B. SC. PHYSICAL SCIENCES
(GEOGRAPHY)

CGL - 302
Core Course – V
GEOGRAPHY OF INDIA
Credits: 02 Hrs (2 Hrs / week)

Marks for Major Test (External): 80

Marks for Internal Exam: 20

Time: 3 Hours

Paper setter is required to set nine questions in all. Question no. 1 is compulsory and is based on the entire syllabus consisting of eight to ten short answer type questions each of two marks. The remaining eight questions are to be set uniformly having two questions from each unit. The students is required to attempt five questions in all selecting one question from each unit and Question No. 1 is compulsory.

Unit-1

1. India: Location, Relief Structure and Drainage Systems.
2. Climate: Seasons of India, Theory of Indian Monsoon.
3. Classification and Distribution of Indian soils and Natural Vegetation.

Unit-II

4. Population: Distribution, Density, Growth, Composition and Migration.
5. Human Settlements: Classification of Urban and Rural Settlements.

Unit-III

6. Land use, Green Revolution and Problems of Indian Agriculture.
7. Regional Variation in Cropping Pattern: Rice, Wheat, Sugarcane, and Cotton.

Unit-IV

8. Energy and mineral resources: coal, petroleum, and Hydroelectricity, iron-ore and mica.
9. Industries – iron and steel and cotton textile and industrial regions.
10. Modes of transport and communication.

Reading List

1. Hussain M., 1992: *Geography of India*, Tata McGraw Hill Education.
2. Mamoria C. B., 1980: *Economic and Commercial Geography of India*, Shiva Lal Agarwala.
3. Miller F. P., Vandome A. F. and McBrewster J., 2009: *Geography of India: Indo- Gangetic Plain, Thar Desert, Major Rivers of India, Climate of India, Geology of India*, Alphascript Publishing.
4. Nag P. and Sengupta S., 1992: *Geography of India*, Concept Publishing.
5. Pichamuthu C. S., 1967: *Physical Geography of India*, National Book Trust.
6. Sharma T. C. and Coutinho O., 1997: *Economic and Commercial Geography of India*, Vikas Publishing.
7. Singh Gopal, 1976: *A Geography of India*, Atma Ram.
8. Spate O. H. K. and Learmonth A. T. A., 1967: *India and Pakistan: A General and Regional Geography*, Methuen.
9. Rana, Tejbir Singh, 2015, *Diversity of India* , R.K. Books, Delhi.

CGL - 303
Core Course – VI
REGIONAL PLANNING WITH SPECIAL REFERENCE TO HARYANA

Credits: 02 Hrs (2 Hrs / week)

Marks for Major Test (External): 80

Marks for Internal Exam: 20

Time: 3 Hours

Paper setter is required to set nine questions in all. Question no. 1 is compulsory and is based on the entire syllabus consisting of eight to ten short answer type questions each of two marks. The remaining eight questions are to be set uniformly having two questions from each unit. The students is required to attempt five questions in all selecting one question from each unit and Question No. 1 is compulsory.

Unit-1

1. Concept, Need and Types of regional planning.
2. Characteristics and Delineation of regional planning.
3. Regionalization of India for planning: Agro – ecological zones.

Unit-II

4. Models for Regional Planning: Growth Pole Theory, Core Periphery Model and Growth Foci Concept in Indian Context.
5. Success Story and failures of Regional Plans: Damodar Valley Corporation (DVC), Integrated Tribal Development programme (ITDP).

Unit-III

6. Physical and economic diversities in Haryana:
 - i). Relief, Climate, Drainage, Groundwater, Soils and Natural Vegetation.
 - ii). Cropping Pattern in Haryana.
 - iii). Industrial regions and means of transportation.

Unit-IV

7. Distribution, density and growth of population in Haryana.
8. Educational development, health facilities and gender issues (sex ratio) in Haryana.

Reading List

1. Blij H. J. De, 1971: *Geography: Regions and Concepts*, John Wiley and Sons.
2. Claval P.I, 1998: *An Introduction to Regional Geography*, Blackwell Publishers, Oxford and Massachusetts.
3. Friedmann J. and Alonso W. (1975): *Regional Policy - Readings in Theory and Applications*, MIT Press, Massachusetts.
4. Gore C. G., 1984: *Regions in Question: Space, Development Theory and Regional Policy*, Methuen, London.
5. Gore C. G., Köhler G., Reich U-P. and Ziesemer T., 1996: *Questioning Development; Essays on the Theory, Policies and Practice of Development Intervention*, Metropolis- Verlag, Marburg.
6. Haynes J., 2008: *Development Studies*, Polity Short Introduction Series.
7. Johnson E. A. J., 1970: *The Organization of Space in Developing Countries*, MIT Press, Massachusetts.
8. Peet R., 1999: *Theories of Development*, The Guilford Press, New York.
9. UNDP 2001-04: *Human Development Report*, Oxford University Press.
10. World Bank 2001-05: *World Development Report*, Oxford University Press, New

CGP – 308*

Practical – III; Geography Lab – III
(Credits: 02, 60 Hours (4 hrs. per week))

Maximum Marks:100

Time: 4 Hours

Note: Distribution of Marks is as under;

Exercise - 60

Record File - 20

Viva – voce - 20

1. For giving marks under Lab. Record each college will maintain practical assessment record by using the following procedure:-

Each student has to perform a minimum number of exercises/experiments prescribed in the syllabus. After the completion of a practical the teacher concerned will check the note book and conduct the Viva – voce of each student to find out how much concepts related to the theoretical and experimental part of the experiment he/ she has understood. According to his/her performance marks will be recorded on their practical note-book. These marks will constitute the lab. Record.

2. To compute the final marks for lab. Record, a separate register will be maintained. Each student will be assigned separate page on this register. On this page the marks obtained by the student in different practical's will be entered. This record will be signed by the concerned teacher.
3. The laboratory Record register will be presented to the external practical examiners for Lab. Record marks. These external examiners may verify the record randomly.

Projection

1. Introduction to Map Projection: Meaning, Classification and importance; Characteristics of latitudes and longitudes lines.
2. Cylindrical projections: Characteristics, applications and drawing; (3 exercises)
 - (i) Simple cylindrical projection
 - (ii) Cylindrical equal area projection.
 - (iii) True shape or orthomorphic or Mercator's Projection.
3. Conical Projections: Characteristics, applications and drawing. (5 exercises)
 - (i) Simple conical projections with one standard parallel
 - (ii) Simple conical projection with two standard parallel

- (iii) Bonne's Projection
- (iv) Polyconic Projection.
- (v) International Map Projection.
- 4. Zenithal Projections: Characteristics, applications and drawing. (5 exercises)
 - (i) Polar Zenithal Equidistant Projection.
 - (ii) Polar Zenithal Equal Area Projection
 - (iii) Polar Zenithal Gnomonic Projection
 - (iv) Polar Zenithal Stereographic Projection.
 - (v) Polar Zenithal Orthographic Projection
- 5. Characteristics, applications and drawings. (2 exercises)
 - (i) Sinusoidal
 - (ii) Mollweide Projections.
- 6. Prismatic Compass Survey. (2 exercises)

Suggested Readings:-

1. Goyal K.K.1981.. Practical Geography, Manthan Publication, Rohtak.
2. Gregory S. 1963. Statistical Methods and the Geography, Longman, London.
3. Khan, A.A. 1996. Text Book of Practical Geography, Concept, New Delhi,.
4. Lawrence, G.P.1968. Cartographic Methods, Methuen, London,.
5. Monkhouse, F.J. and Wilkinson, H.R.1994. Maps and Diagrams, Methuen, London,
6. Pal. S.K. 1998: Statistics for Geoscientist- Techniques and Applications, Concept Publication, New Delhi,.
7. Sarkar, A.K 1997: Practical Geography-A Systematic Approach, Orient Longman, Calcutta,.
8. Singh, R.L. 1972. Elements of Practical Geography, Kalyani Pub., New Delhi
9. Steers, J.B. Map Projections; University of London Press, London.

CGL - 402

Core Course – VII

ENVIRONMENTAL GEOGRAPHY

Credits: 02 Hrs (2 Hrs / week)

Marks for Major Test (External): 80

Marks for Internal Exam: 20

Time: 3 Hours

Paper setter is required to set nine questions in all. Question no. 1 is compulsory and is based on the entire syllabus consisting of eight to ten short answer type questions each of two marks. The remaining eight questions are to be set uniformly having two questions from each unit. The students is required to attempt five questions in all selecting one question from each unit and Question No. 1 is compulsory.

Unit-I

1. Environmental Geography: Definition, Concepts and Scope.
2. Approaches to the study of environmental geography.

Unit- II

3. Ecosystem: Concept, Structure and functions.
4. Flow of energy; food chain and food web; trophic level.

Unit- III

5. Biomes and Habitat: Tropical rainforest biome, Grassland biomes and Desert biome.
6. Environmental Problems and Management: Climate change and Global warming.

Unit – IV

7. Environmental Programmes and Policies – Developed countries and Developing countries.
8. Global Environmental concerns: Stockholm conference, Earth summit and Kyoto protocol and after.

Reading List

1. Casper J.K. (2010) Changing Ecosystems: Effects of Global Warming. Infobase Pub. New York.
2. Hudson, T. (2011) Living with Earth: An Introduction to Environmental Geology, PHI Learning Private Limited, New Delhi.
3. Miller, G.T. (2007) Living in the Environment: Principles, Connections, and Solutions, Brooks/ Cole Cengage Learning, Belmont.
4. Singh, R.B. (1993) Environmental Geography, Heritage Publishers, New Delhi.
5. UNEP (2007) Global Environment Outlook: GEO4: Environment For Development, United Nations Environment Programme. University Press, Cambridge.
6. Wright R. T. and Boorse, D. F. (2010) Toward a Sustainable Future, PHI Learning Pvt Ltd, New Delhi.
7. Singh, R.B. and Hietala, R. (Eds.) (2014) Livelihood security in Northwestern Himalaya: Case studies from changing socio-economic environments in Himachal Pradesh, India. Advances in Geographical and Environmental Studies, Springer
8. Singh, Savindra 2001. *Paryavaran Bhugol*, Prayag Pustak Bhawan, Allahabad. (in Hindi)

CGL - 403
Core Course – VIII
GEOGRAPHY OF DISASTER
Credits: 02 Hrs (2 Hrs / week)

Marks for Major Test (External): 80

Marks for Internal Exam: 20

Time: 3 Hours

Paper setter is required to set nine questions in all. Question no. 1 is compulsory and is based on the entire syllabus consisting of eight to ten short answer type questions each of two marks. The remaining eight questions are to be set uniformly having two questions from each unit. The students is required to attempt five questions in all selecting one question from each unit and Question No. 1 is compulsory.

Unit - I

1. Hazards, Risk, Vulnerability and Disasters: Definition and Concepts.
2. Tectonic disasters: Earthquakes, Tsunamis and Volcanic eruption in India.

Unit – II

3. Hydrological disasters: Occurrence and impact of floods and droughts in India.
4. Climatic disasters: Tropical cyclones, Heavy Precipitation Events-Cloud Burst, Heat and cold waves.

Unit - III

5. Human induced disasters: Forest Fire, Road Accidents, Agricultural residual burning.
6. Mitigation and Preparedness for disasters, NDMA and NIDM: Indigenous Knowledge and Community – based disaster management. Do's and Don'ts During disaster.

Unit – IV

7. Post disaster Rehabilitation: Policies and Programmes.
8. Major Disaster in India: Bhopal Gas Tragedy, Bhuj Earthquake, Kashmir flood.

Reading List

1. Government of India. (1997) Vulnerability Atlas of India. New Delhi, Building Materials & Technology Promotion Council, Ministry of Urban Development, Government of India.
2. Kapur, A. (2010) Vulnerable India: A Geographical Study of Disasters, Sage Publication, New Delhi.
3. Modh, S. (2010) Managing Natural Disaster: Hydrological, Marine and Geological Disasters, Macmillan, Delhi.
4. Singh, R.B. (2005) Risk Assessment and Vulnerability Analysis, IGNOU, New Delhi. Chapter 1, 2 and 3
5. Singh, R. B. (ed.), (2006) Natural Hazards and Disaster Management: Vulnerability and Mitigation, Rawat Publications, New Delhi.
6. Sinha, A. (2001). Disaster Management: Lessons Drawn and Strategies for Future, New United Press, New Delhi.
7. Stoltman, J.P. et al. (2004) International Perspectives on Natural Disasters, Kluwer Academic Publications. Dordrecht.
8. Singh Jagbir (2007) "Disaster Management Future Challenges and Opportunities", 2007. Publisher- I.K. International Pvt. Ltd. S-25, Green Park Extension, Uphaar Cinema Market, New Delhi, India (www.ikbooks.com).

CGP – 408*

Practical – IV; Geography Lab – IV
(Credits: 02, 60 Hours (4 hrs. per week))

Maximum Marks: 100
Time: 4 Hours

Note: Distribution of Marks is as under;

Exercise - 60

Record File - 20

Viva – voce - 20

1. For giving marks under Lab. Record each college will maintain practical assessment record by using the following procedure:-

Each student has to perform a minimum number of exercises/experiments prescribed in the syllabus. After the completion of a practical the teacher concerned will check the note book and conduct the Viva – voce of each student to find out how much concepts related to the theoretical and experimental part of the experiment he/ she has understood. According to his/her performance marks will be recorded on their practical note-book. These marks will constitute the lab. Record.

2. To compute the final marks for lab. Record, a separate register will be maintained. Each student will be assigned separate page on this register. On this page the marks obtained by the student in different practical's will be entered. This record will be signed by the concerned teacher.
3. The laboratory Record register will be presented to the external practical examiners for Lab. Record marks. These external examiners may verify the record randomly.

Remote Sensing and GPS based Project Report

1. Remote Sensing: Definition, Development, Platforms and Types.
2. Aerial Photography: Principles, Types and Geometry.
3. Satellite Remote Sensing: Principles, EMR Interaction with Atmosphere and Earth surface; Satellites (Land sat & IRS) and Sensors.
4. Interpretation and Application of Remote Sensing: Land use / Land Cover
5. Global Positioning System (GPS): Principles and Uses.

Practical Record: A Project file consisting of following exercises;

1. Demarcation of Principal Point, Conjugate Principal point and Flight line on Aerial Photographs – 3 Exercises.
2. Determination of Scale of Aerial Photographs – 3 Exercises.
3. Interpretation of Single Vertical Photographs – 1 Exercise.
4. Use of Stereoscope and Identification of Features – 1 Exercise.
5. Identification of Features (Different Topography) on IRSID, LISS III imagery (Mark copy of FCC) -3

Suggested Readings:-

1. John R. Jensen, Remote Sensing of the Environment; An Earth Resource Perspective, Pearson Education, (India Edition) New Delhi, 2009.
2. Lillesand and R.W. Kiefer, Remote Sensing and Image Interpretation, John Wiley and Sons, 1994.

SEMESTER III&IV

B. SC. PHYSICAL SCIENCES

(CHEMISTRY)

Semester III

CCL-304

CORE COURSE-V

PHYSICAL CHEMISTRY-II:

(SOLUTIONS, PHASE EQUILIBRIUM, CONDUCTANCE & ELECTROCHEMISTRY)

Credits: 02; 30 Hrs (2Hrs /week)

Marks for Major Test (External): 80

Marks for Internal Exam: 20

Time: 3Hrs

Note: The examiner is requested to set nine questions in all, selecting two questions from each UNIT and one compulsory question (Question No.1 based on entire syllabus will consist of eight short answer type questions each of two marks). The candidate is required to attempt five questions in all selecting one from each UNIT and the compulsory Question No.1.

UNIT-I

Solutions

Thermodynamics of ideal solutions: Ideal solutions and Raoult's law, deviations from Raoult's law – non-ideal solutions. Vapour pressure-composition and temperature composition curves of ideal and non-ideal solutions. Distillation of solutions. Azeotropes. Colligative properties of solutions. Thermodynamic derivations of relation between amount of solute and elevation in boiling point and depression in freezing point.

Partial miscibility of liquids: Critical solution temperature; effect of impurity on partial miscibility of liquids. Immiscibility of liquids- Principle of steam distillation.

(8 Hours)

UNIT-II

Phase Equilibrium

Phases, components and degrees of freedom of a system, criteria of phase equilibrium. Gibbs Phase Rule and its thermodynamic derivation. Derivation of Clausius – Clapeyron equation and its importance in phase equilibria. Phase diagrams of one-component systems (water and sulphur) and two component systems involving eutectics, congruent and incongruent melting points (lead-silver, and Na-K only).

(7 Hours)

UNIT-III

Conductance

Conductivity, equivalent and molar conductivity and their variation with dilution for weak and strong electrolytes. Kohlrausch law of independent migration of ions.

Transference number, ionic mobility. Applications of conductance measurements: determination of degree of ionization of weak electrolyte, solubility and solubility products of sparingly soluble salts, ionic product of water, hydrolysis constant of a salt. Conductometric titrations (only acid-base). Concept of pH and pK_a , buffer solution, buffer action, Henderson-Hasselbalch equation.

(7 Hours)

UNIT-IV

Electrochemistry

Reversible and irreversible cells. Concept of EMF of a cell. Measurement of EMF of a cell. Nernst equation and its importance. Types of electrodes. Standard electrode potential. Electrochemical series. Thermodynamics of a reversible cell, calculation of thermodynamic properties: ΔG , ΔH and ΔS from EMF data.

Calculation of equilibrium constant from EMF data. Concentration cells with transference and without transference. Liquid junction potential and salt bridge. pH determination using hydrogen electrode and quinhydrone electrode.

Potentiometric titrations -qualitative treatment (acid-base and oxidation-reduction only).

(8 Hours)

Reference Books:

- Barrow, G.M. *Physical Chemistry* Tata McGraw-Hill (2007).
- Castellan, G.W. *Physical Chemistry* 4th Ed. Narosa (2004).
- Kotz, J.C., Treichel, P.M. & Townsend, J.R. *General Chemistry*, Cengage Learning India Pvt. Ltd.: New Delhi (2009).
- Mahan, B.H. *University Chemistry*, 3rd Ed. Narosa (1998).
- Petrucci, R.H. *General Chemistry*, 5th Ed., Macmillan Publishing Co.: New York (1985).

CCL-305
CORE COURSE-VI
ORGANIC CHEMISTRY-III:
(FUNCTIONAL GROUP ORGANIC CHEMISTRY-II)
Credits: 02; 30 Hrs (2Hrs /week)

Marks for Major Test (External): 80

Marks for Internal Exam: 20

Time: 3Hrs

Note: The examiner is requested to set nine questions in all, selecting two questions from each UNIT and one compulsory question (Question No.1 based on entire syllabus will consist of eight short answer type questions each of two marks). The candidate is required to attempt five questions in all selecting one from each UNIT and the compulsory Question No.1.

UNIT-I

Functional group approach for the following reactions (preparations & reactions) to be studied in context to their structure for Units I-IV.

Carboxylic acids and their derivatives

Carboxylic acids (aliphatic and aromatic)

Preparation: Acidic and Alkaline hydrolysis of esters.

Reactions: Hell-Vohlard-Zelinsky Reaction.

Carboxylic acid derivatives (aliphatic): (Upto 5 carbons)

Preparation: Acid chlorides, Anhydrides, Esters and Amides from acids and their interconversion.

Reactions: Comparative study of nucleophilicity of acyl derivatives. Reformatsky Reaction, Perkin condensation.

(7 Hours)

UNIT-II

Amines and Diazonium Salts

Amines (Aliphatic and Aromatic): (Upto 5 carbons)

Preparation: from alkyl halides, Gabriel's Phthalimide synthesis, HofmannBromamide reaction.

Reactions: Hofmann vs. Saytzeff elimination, Carbylamine test, Hinsberg test, with HNO₂, Schotten-Baumann Reaction. Electrophilic substitution (case aniline): nitration, bromination, sulphonation.

Diazonium salts: *Preparation:* from aromatic amines. *Reactions:* conversion to benzene, phenol, dyes.

(8 Hours)

UNIT-III

Amino Acids, Peptides and Proteins:

Preparation of Amino Acids: Strecker synthesis using Gabriel's phthalimide synthesis. Zwitterion, Isoelectric point and Electrophoresis.

Reactions of Amino acids: ester of –COOH group, acetylation of –NH₂ group, complexation with Cu²⁺ ions, ninhydrin test.

Overview of Primary, Secondary, Tertiary and Quaternary Structure of proteins.

Determination of Primary structure of Peptides by degradation Edmann degradation (N-terminal) and C-terminal (thiohydantoin and with carboxypeptidase enzyme). Synthesis of simple peptides (upto dipeptides) by N-protection (t-butyloxycarbonyl and phthaloyl) & C-activating groups and Merrifield solid-phase synthesis.

(8 Hours)

UNIT-IV

Carbohydrates:

Classification, and General Properties, Glucose and Fructose (open chain and cyclic structure), Determination of configuration of monosaccharides, absolute configuration of Glucose and Fructose, Mutarotation, ascending and descending in monosaccharides. Structure of disaccharides (sucrose, cellobiose, maltose, lactose) and polysaccharides (starch and cellulose) excluding their structure elucidation.

(7 Hours)

Reference Books:

- Morrison, R. T. & Boyd, R. N. *Organic Chemistry*, Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
- Finar, I. L. *Organic Chemistry (Volume 1)*, Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
- Finar, I. L. *Organic Chemistry (Volume 2)*, Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
- Nelson, D. L. & Cox, M. M. *Lehninger's Principles of Biochemistry 7th Ed.*, W. H. Freeman.
- Berg, J.M., Tymoczko, J.L. & Stryer, L. *Biochemistry*, W.H. Freeman, 2002. Kotz, J.C., Treichel, P.M. & Townsend, J.R. *General Chemistry*, Cengage Learning India Pvt. Ltd.: New Delhi (2009).
- Petrucci, R.H. *General Chemistry*, 5th Ed., Macmillan Publishing Co.: New York (1985).

CCP-309
PRACTICAL-III
CHEMISTRY LAB-III:
(SOLUTIONS, PHASE EQUILIBRIUM, CONDUCTANCE, ELECTROCHEMISTRY & FUNCTIONAL GROUP
ORGANIC CHEMISTRY)
Credits: 02; 60 Hrs (4Hrs /week)

Marks (External): 100

Time: 6Hrs

Section A: Physical Chemistry

Solutions: Determination of molecular weight of non volatile solute by Rast Method.

Phase equilibria: i. Construction of the phase diagram of a binary system (simple eutectic) using cooling curves.

ii. Determination of the critical solution temperature and composition of the phenol water system and study of the effect of impurities on it.

iii. Study of the variation of mutual solubility temperature with concentration for the phenol water system and determination of the critical solubility temperature.

Conductance: i. Determination of cell constant

ii. Determination of equivalent conductance, degree of dissociation and dissociation constant of a weak acid.

iii. Perform the following conductometric titrations:

a. Strong acid vs. strong base

b. Weak acid vs. strong base

Potentiometry: Perform the following potentiometric titrations:

i. Strong acid vs. strong base

ii. Weak acid vs. strong base

iii. Potassium dichromate vs. Mohr's salt

Section B: Organic Chemistry

I. Systematic Qualitative Organic Analysis of Organic Compounds possessing monofunctional groups (-COOH, phenolic, aldehydic, ketonic, amide, nitro, amines) and preparation of one derivative.

II. 1. Separation of amino acids by paper/thin layer chromatography.

2. Determination of the concentration of glycine solution by formylation method.

3. Titration curve of glycine

4. Action of salivary amylase on starch

5. Effect of temperature on the action of salivary amylase on starch.

6. Differentiation between a reducing and a nonreducing sugar.

Reference Books:

- Vogel, A.I., Tatchell, A.R., Furnis, B.S., Hannaford, A.J. & Smith, P.W.G., *Textbook of Practical Organic Chemistry*, Prentice-Hall, 5th edition, 1996.
- Mann, F.G. & Saunders, B.C. *Practical Organic Chemistry* Orient-Longman, 1960.
- Khosla, B. D.; Garg, V. C. & Gulati, A. *Senior Practical Physical Chemistry*, R. Chand & Co.: New Delhi (2011).
- Ahluwalia, V.K. & Aggarwal, R. *Comprehensive Practical Organic Chemistry*, Universities Press.

Semester IV

CCL-404
CORE COURSE-VII
INORGANIC CHEMISTRY-II:
TRANSITION METALS & COORDINATION CHEMISTRY
Credits: 02; 30 Hrs (2Hrs /week)

Marks for Major Test (External): 80

Marks for Internal Exam: 20

Time: 3Hrs

Note: The examiner is requested to set nine questions in all, selecting two questions from each UNIT and one compulsory question (Question No.1 based on entire syllabus will consist of eight short answer type questions each of two marks). The candidate is required to attempt five questions in all selecting one from each UNIT and the compulsory Question No.1.

UNIT-I

Transition Elements (3d series)

General group trends with special reference to electronic configuration, variable valency, colour, magnetic and catalytic properties, ability to form complexes and stability of various oxidation states (Latimer diagrams) for Mn, Fe and Cu.

(8 Hours)

UNIT-II

Lanthanoids and actinoids

Electronic configurations, oxidation states, colour, magnetic properties, lanthanide contraction, separation of lanthanides (ion exchange method only).

(7 Hours)

UNIT-III

Coordination Chemistry

Valence Bond Theory (VBT): Inner and outer orbital complexes of Cr, Fe, Co, Ni and Cu (coordination numbers 4 and 6). Structural and stereoisomerism in complexes with coordination numbers 4 and 6. Drawbacks of VBT. IUPAC system of nomenclature.

(7 Hours)

UNIT-IV

Crystal Field Theory

Crystal field effect, octahedral symmetry. Crystal field stabilization energy (CFSE), Crystal field effects for weak and strong fields. Tetrahedral symmetry. Factors affecting the magnitude of d-orbital splittings. Spectrochemical series. Comparison of CFSE for O_h and T_d complexes, Tetragonal distortion of octahedral geometry. Jahn-Teller distortion, Square planar coordination.

(8 Hours)

Reference Books:

- Cotton, F.A. & Wilkinson, G. *Basic Inorganic Chemistry*, Wiley.
- Shriver, D.F. & Atkins, P.W. *Inorganic Chemistry*, Oxford University Press.
- Wulfsberg, G. *Inorganic Chemistry*, Viva Books Pvt. Ltd.
- Rodgers, G.E. *Inorganic & Solid State Chemistry*, Cengage Learning India Ltd., 2008.

CCL-405
CORE COURSE-VIII
PHYSICAL CHEMISTRY-III:
STATES OF MATTER & CHEMICAL KINETICS
Credits: 02; 30 Hrs (2Hrs /week)

Marks for Major Test (External): 80

Marks for Internal Exam: 20

Time: 3Hrs

Note: The examiner is requested to set nine questions in all, selecting two questions from each UNIT and one compulsory question (Question No.1 based on entire syllabus will consist of eight short answer type questions each of two marks). The candidate is required to attempt five questions in all selecting one from each UNIT and the compulsory Question No.1.

UNIT-I

Kinetic Theory of Gases

Postulates of Kinetic Theory of Gases and derivation of the kinetic gas equation.

Deviation of real gases from ideal behaviour, compressibility factor, causes of deviation. van der Waals equation of state for real gases. Boyle temperature (derivation not required). Critical phenomena, critical constants and their calculation from van der Waals equation. Andrews isotherms of CO₂.

Maxwell Boltzmann distribution laws of molecular velocities and molecular energies (graphic representation – derivation not required) and their importance.

Temperature dependence of these distributions. Most probable, average and root mean square velocities (no derivation). Collision cross section, collision number, collision frequency, collision diameter and mean free path of molecules.

(8 Hours)

UNIT-II

Liquids: Surface tension and its determination using stalagmometer. Viscosity of a liquid and determination of coefficient of viscosity using Ostwald viscometer. Effect of temperature on surface tension and coefficient of viscosity of a liquid (qualitative treatment only).

(7 Hours)

UNIT-III

Solids: Forms of solids. Symmetry elements, unit cells, crystal systems, Bravais lattice types and identification of lattice planes. Laws of Crystallography - Law of constancy of interfacial angles, Law of rational indices. Miller indices. X-Ray diffraction by crystals, Bragg's law. Structures of NaCl, KCl and CsCl (qualitative treatment only). Defects in crystals.

(7 Hours)

UNIT-IV

Chemical Kinetics: The concept of reaction rates. Effect of temperature, pressure, catalyst and other factors on reaction rates. Order and molecularity of a reaction. Derivation of integrated rate

equations for zero, first and second order reactions (both for equal and unequal concentrations of reactants). Half-life of a reaction. General methods for determination of order of a reaction. Concept of activation energy and its calculation from Arrhenius equation.

Theories of Reaction Rates: Collision theory and Activated Complex theory of bimolecular reactions. Comparison of the two theories (qualitative treatment only).

(8 Hours)

Reference Books:

- Barrow, G.M. *Physical Chemistry* Tata McGraw-Hill (2007).
 - Castellan, G.W. *Physical Chemistry* 4th Ed. Narosa (2004).
 - Kotz, J.C., Treichel, P.M. & Townsend, J.R. *General Chemistry* Cengage Learning India Pvt. Ltd., New Delhi (2009).
 - Mahan, B.H. *University Chemistry* 3rd Ed. Narosa (1998).
 - Petrucci, R.H. *General Chemistry* 5th Ed. Macmillan Publishing Co.: New York (1985).
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CCP-409
PRACTICAL-IV
CHEMISTRY LAB IV:
(TRANSITION METAL & COORDINATION CHEMISTRY, STATES OF MATTER & CHEMICAL KINETICS)
Credits: 02; 60 Hrs (4 Hrs /week)

Marks (External): 100

Time: 6Hrs

Section A: Inorganic Chemistry

Semi-micro qualitative analysis (using H_2S or other methods) of mixtures - not more than four ionic species (two anions and two cations, excluding insoluble and interfering salts) out of the following:

Cations : NH_4^+ , Pb^{2+} , Bi^{3+} , Cu^{2+} , Cd^{2+} , Fe^{3+} , Al^{3+} , Co^{2+} , Ni^{2+} , Mn^{2+} , Zn^{2+} , Ba^{2+} , Sr^{2+} , Ca^{2+} , K^+

Anions : CO_3^{2-} , S^{2-} , SO_3^{2-} , $\text{S}_2\text{O}_3^{2-}$, NO_2^- , CH_3COO^- , Cl^- , Br^- , I^- , NO_3^- , SO_4^{2-} , PO_4^{3-} , BO_3^{3-} , $\text{C}_2\text{O}_4^{2-}$,

(Spot tests should be carried out wherever feasible)

1. Estimate the amount of nickel present in a given solution as bis(dimethylglyoximate)nickel (II) in a given solution gravimetrically.
2. Estimation of (i) Mg^{2+} or (ii) Zn^{2+} by complexometric titrations using EDTA.
3. Estimation of total hardness of a given sample of water by complexometric titration.

Section B: Physical Chemistry

I. Surface tension measurement (use of organic solvents excluded).

- a. Determination of the surface tension of a liquid or a dilute solution using a stalagmometer.
- b. Study of the variation of surface tension of a detergent solution with concentration.

II. Viscosity measurement (use of organic solvents excluded).

- a. Determination of the viscosity of a liquid or dilute solution using an Ostwald's viscometer.
- b. Study of the variation of viscosity of an aqueous solution with concentration of solute.

III. Chemical Kinetics

Study the kinetics of the following reactions by integrated rate method:

- a. Acid hydrolysis of methyl acetate with hydrochloric acid.
- b. Saponification of ethyl acetate.
- c. Compare the strengths of HCl and H_2SO_4 by studying kinetics of hydrolysis of methyl acetate

Reference Books:

- Svehla, G. *Vogel's Qualitative Inorganic Analysis*, Pearson Education, 2012.
 - Mendham, J. *Vogel's Quantitative Chemical Analysis*, Pearson, 2009.
 - Khosla, B. D.; Garg, V. C. & Gulati, A. *Senior Practical Physical Chemistry*, R. Chand & Co.: New Delhi (2011).
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SEMESTER III & IV
B. SC. PHYSICAL SCIENCES
(ELECTRONICS)

Semester III

CEL 304

Core Course V (Electronics) Communication Electronics - I

(Credits: 02; 30 Hrs (2Hrs /week)))

Marks for Major Test (External): 80

Marks for Internal Exam: 20

Time: 3 Hours

Paper setter is required to set nine questions in all. Question no. 1 is Compulsory and is based on the entire syllabus consisting of eight to ten short answer type questions each of 2 marks. The remaining eight questions is to be set uniformly having two questions from each unit. The student is required to attempt five questions in all selecting one question from each unit and Question no. 1 is Compulsory wherein student is required to attempt 8 parts.

UNIT-I

(8 Hours)

Electronic communication:

Introduction to communication – means and modes. Need for modulation. Block diagram of an electronic communication system. Brief idea of frequency allocation for radio communication system in India (TRAI). Electromagnetic communication spectrum, band designations and usage. Channels and base-band signals. Concept of Noise, signal-to-noise (S/N) ratio.

UNIT-II

(8 Hours)

Analog Modulation:

Amplitude Modulation, modulation index and frequency spectrum. Generation of AM (Emitter Modulation), Amplitude Demodulation (diode detector), Concept of Single side band generation and detection.

UNIT-III

(7 Hours)

Analog Modulation:

Frequency Modulation (FM) and Phase Modulation (PM), modulation index and frequency spectrum, equivalence between FM and PM, Generation of FM using VCO, FM detector (slope detector), Qualitative idea of Super heterodyne receiver.

UNIT-IV

(7 Hours)

Analog Pulse Modulation:

Channel capacity, Sampling theorem, Basic Principles- PAM, PWM, PPM modulation and detection technique for PAM only, Multiplexing.

Reference Books:

- Modern Digital and Analog Communication Systems, B.P. Lathi, 4th Edition, 2011, Oxford University Press.
- Electronic Communications, D. Roddy and J. Coolen, Pearson Education India.
- Advanced Electronics Communication Systems- Tomasi, 6th edition, Prentice Hall.
- Principles of Electronic communication systems – Frenzel, 3rd edition, McGraw Hill
- Communication Systems, S. Haykin, 2006, Wiley India
- Electronic Communication system, Blake, Cengage, 5th edition.
- Wireless communications, Andrea Goldsmith, 2015, Cambridge University Press

CEL 305
Core Course VI (Electronics)
Microprocessor
(Credits: 02; 30 Hrs (2Hrs /week))

Marks for Major Test (External): 80

Marks for Internal Exam: 20

Time: 3 Hours

Paper setter is required to set nine questions in all. Question no. 1 is Compulsory and is based on the entire syllabus consisting of eight to ten short answer type questions each of 2 marks. The remaining eight questions is to be set uniformly having two questions from each unit. The student is required to attempt five questions in all selecting one question from each unit and Question no. 1 is Compulsory wherein student is required to attempt 8 parts.

UNIT-I

(8 Hours)

Microcomputer Organization:

Input/Output Devices. Data storage (idea of RAM and ROM). Computer memory. Memory organization & addressing. Memory Interfacing. Memory Map.

UNIT-II

(6 Hours)

8085 Microprocessor Architecture:

Main features of 8085. Block diagram. Pin-out diagram of 8085. Data and address buses. Registers. ALU. Stack memory. Program counter. Hardware and software interrupts.

UNIT-III

(8 Hours)

8085 Programming :

Instruction classification, Instructions set (Data transfer including stacks. Arithmetic, logical, branch, and control instructions). Subroutines, delay loops. Timing & Control circuitry. Timing states. Instruction cycle, Timing diagram of MOV and MVI.

UNIT-IV

(7 Hours)

Introduction to embedded system:

Embedded systems and general purpose computer systems. Architecture of embedded system. Classifications, applications and purpose of embedded systems.

Reference Books:

- Microprocessor Architecture Programming & applications with 8085, 2002, R.S.Goankar, Prentice Hall.
- Microprocessor and Microcontrollers, N. Senthil Kumar, 2010, Oxford University Press
- Advanced Microprocessors and Interfacing : Badri Ram; TMH
- Introduction to embedded system, K.V. Shibu, 1st edition, 2009, McGraw Hill
- Embedded Systems: Architecture, Programming & Design, Raj Kamal, 2008, Tata McGraw Hill
- The 8051 Microcontroller and Embedded Systems Using Assembly and C, M.A. Mazidi, J.G. Mazidi, and R.D. McKinlay, 2nd Ed., 2007, Pearson Education India.

CEP 309
Practical III (Electronics)
Communication Electronics LAB
(Credits: 02; 60 Hrs (4Hrs /week))

Marks: 100
Time: 4 Hours

At least 8 experiments are to be performed including at least 6 experiments from following:

1. To design an Amplitude Modulator using Transistor.
2. To study envelope detector for demodulation of AM signal
3. To study FM Generator and Detector circuit
4. To study AM Transmitter and Receiver
5. To study FM Transmitter and Receiver
6. To study Time Division Multiplexing (TDM)
7. To study Pulse Amplitude Modulation (PAM)
8. To study Pulse Width Modulation (PWM)
9. To study Pulse Position Modulation (PPM)
10. To study Pulse Code Modulation (PCM)

Semester IV

CEL 404

Core Course-VII (Electronics) Communication Electronics - II (Credits: 02; 30 Hrs (2Hrs /week))

Marks for Major Test (External): 80

Marks for Internal Exam: 20

Time: 3 Hours

Paper setter is required to set nine questions in all. Question no. 1 is Compulsory and is based on the entire syllabus consisting of eight to ten short answer type questions each of 2 marks. The remaining eight questions is to be set uniformly having two questions from each unit. The student is required to attempt five questions in all selecting one question from each unit and Question no. 1 is Compulsory wherein student is required to attempt 8 parts.

UNIT-I

(8 Hours)

Digital Pulse Modulation:

Need for digital transmission, Pulse Code Modulation, Digital Carrier Modulation Techniques, Sampling, Quantization and Encoding. Concept of Amplitude Shift Keying (ASK), Frequency Shift Keying (FSK), Phase Shift Keying (PSK), and Binary Phase Shift Keying (BPSK).

UNIT-II

(8 Hours)

Introduction to Communication and Navigation systems:

Satellite Communication– Introduction, need, Geosynchronous satellite orbits, geostationary satellite, advantages of geostationary satellites. Satellite visibility, transponders (C - Band), path loss, ground station, simplified block diagram of earth station. Uplink and downlink. GPS navigation system (qualitative idea only)

UNIT-III

(7 Hours)

Mobile Telephony System:

Basic concept of mobile communication, frequency bands used in mobile communication, concept of cell sectoring and cell splitting, SIM number, IMEI number, need for data encryption

UNIT-IV

(7 Hours)

Mobile Telephony System:

Architecture (block diagram) of mobile communication network, idea of GSM, CDMA, TDMA and FDMA technologies, simplified block diagram of mobile phone handset, 2G, 3G and 4G concepts (qualitative only).

Reference Books:

- Modern Digital and Analog Communication Systems, B.P. Lathi, 4th Edition, 2011, Oxford University Press.
- Electronic Communications, D. Roddy and J. Coolen, Pearson Education India.
- Advanced Electronics Communication Systems- Tomasi, 6th edition, Prentice Hall.
- Principles of Electronic communication systems – Frenzel, 3rd edition, McGraw Hill
- Communication Systems, S. Haykin, 2006, Wiley India
- Electronic Communication system, Blake, Cengage, 5th edition.
- Wireless communications, Andrea Goldsmith, 2015, Cambridge University Press

CEL 405
Core Course-VIII (Electronics)
Microcontroller
(Credits: 02; 30 Hrs (2Hrs /week))

Marks for Major Test (External): 80

Marks for Internal Exam: 20

Time: 3 Hours

Paper setter is required to set nine questions in all. Question no. 1 is Compulsory and is based on the entire syllabus consisting of eight to ten short answer type questions each of 2 marks. The remaining eight questions is to be set uniformly having two questions from each unit. The student is required to attempt five questions in all selecting one question from each unit and Question no. 1 is Compulsory wherein student is required to attempt 8 parts.

UNIT-I

(8 Hours)

8051 microcontroller:

Introduction and block diagram of 8051 microcontroller, architecture of 8051, overview of 8051 family, 8051 assembly language programming, Program Counter and ROM memory map, Data types and directives, Flag bits and Program Status Word (PSW) register, Jump, loop and call instructions.

UNIT-II

(7 Hours)

8051 I/O port programming:

Introduction of I/O port programming, pin out diagram of 8051 microcontroller, I/O port pins description & their functions, I/O port programming in 8051 (using assembly language), I/O programming: Bit manipulation.

UNIT-III

(8 Hours)

8051 Programming:

8051 addressing modes and accessing memory locations using various addressing modes, assembly language instructions using each addressing mode, arithmetic and logic instructions

UNIT-IV

(7 Hours)

8051 Programming:

8051 programming in C: for time delay & I/O operations and manipulation, for arithmetic and logic operations, for ASCII and BCD conversions.

Reference Books:

- The 8051 Microcontroller and Embedded Systems Using Assembly and C, M.A. Mazidi, J.G. Mazidi, and R.D. McKinlay, 2nd Ed., 2007, Pearson Education India.
- Microprocessor and Microcontrollers, N. Senthil Kumar, 2010, Oxford University Press
- 8051 microcontrollers, Satish Shah, 2010, Oxford University Press.
- Introduction to embedded system, K.V. Shibu, 1st edition, 2009, McGraw Hill
- Embedded Systems: Architecture, Programming & Design, Raj Kamal, 2008, Tata McGraw Hill
- Embedded Systems: Design & applications, S.F. Barrett, 2008, Pearson Education India
- Embedded Microcomputer systems: Real time interfacing, J.W. Valvano 2011, Cengage Learning

CEP 409
Practical -IV (Electronics)
Microprocessor and Microcontroller Lab
(Credits: 02; 60 Hrs (4Hrs /week))

Marks: 100

Time: 4 Hours

At least 8 experiments are to be performed including at least 6 experiments from following:

Section-A: Programs using 8085 Microprocessor

1. Addition and subtraction of numbers using direct addressing mode
2. Addition and subtraction of numbers using indirect addressing mode
3. Multiplication by repeated addition.
4. Division by repeated subtraction.
5. Handling of 16-bit Numbers.
6. Use of CALL and RETURN Instruction.
7. Block data handling.
8. Other programs (e.g. Parity Check, using interrupts, etc.).

Section-B: Experiments using 8051 microcontroller:

1. To find that the given numbers is prime or not.
2. To find the factorial of a number.
3. Write a program to make the two numbers equal by increasing the smallest number and decreasing the largest number.
4. Use one of the four ports of 8051 for O/P interfaced to eight LED's. Simulate binary counter (8 bit) on LED's .
5. Program to glow the first four LEDs then next four using TIMER application.
6. Program to rotate the contents of the accumulator first right and then left.
7. Program to run a countdown from 9-0 in the seven segment LED display.
8. To interface seven segment LED display with 8051 microcontroller and display 'HELP' in the seven segment LED display.
9. To toggle '1234' as '1324' in the seven segment LED display.
10. Interface stepper motor with 8051 and write a program to move the motor through a given angle in clock wise or counter clockwise direction.
11. Application of embedded systems: Temperature measurement & display on LCD

SEMESTER III & IV
B. SC. PHYSICAL SCIENCES
(MATHEMATICS)

CML 306: Advanced Calculus

Marks (Theory): 80

Marks (Internal Assessment) : 20

Marks(Total) : 100

Time : 3 Hrs

Note: Attempt five questions in all. The question paper will consist of **four** sections. **Question No. 1** will contain **seven** short answer type questions without any internal choice covering the entire syllabus and shall be **compulsory**. Each of the four sections **(I-IV)** will contain two questions and the students are required to attempt **one** question from each section. **All questions carry equal marks.**

Section – I

Continuity, Sequential Continuity, properties of continuous functions, Uniform continuity, chain rule of differentiability. Mean value theorems; Rolle's Theorem and Lagrange's mean value theorem and their geometrical interpretations. Taylor's Theorem with various forms of remainders, Darboux intermediate value theorem for derivatives, Indeterminate forms.

Section – II

Limit and continuity of real valued functions of two variables. Partial differentiation. Total Differentials; Composite functions & implicit functions. Change of variables. Homogenous functions & Euler's theorem on homogeneous functions. Taylor's theorem for functions of two variables.

Section – III

Differentiability of real valued functions of two variables. Schwarz and Young's theorems. Implicit function theorem. Maxima, Minima and saddle points of two variables. Lagrange's method of multipliers.

Section – IV

Jacobians, Beta and Gamma functions, Double and Triple integrals, Dirichlet's integrals, change of order of integration in double integrals.

Books Recommended:

1. Gabriel Klaumber, Mathematical analysis, Marcel Dekkar, Inc., New York, 1975
2. R.R. Goldberg, Real Analysis, Oxford & I.B.H. Publishing Co., New Delhi, 1970
3. Gorakh Prasad, Differential Calculus, Pothishala Pvt. Ltd., Allahabad
4. S.C. Malik, Mathematical Analysis, Wiley Eastern Ltd., Allahabad.
5. Shanti Narayan, A Course in Mathematical Analysis, S.Chand and company, New Delhi
6. Murray, R. Spiegel, Theory and Problems of Advanced Calculus, Schaum Publishing co., New York

CML 307: Numerical Analysis

Marks (Theory): 80

Marks (Internal Assessment): 20

Marks (Total): 100

Time: 3 Hrs

Note: Attempt five questions in all. The question paper will consist of **four** sections. **Question No. 1** will contain **seven** short answer type questions without any internal choice covering the entire syllabus and shall be **compulsory**. Each of the four sections (**I-IV**) will contain two questions and the students are required to attempt **one** question from each section. **All questions carry equal marks.**

Section – I

Finite Difference operators and their relations, difference table, finding the missing terms and effect of error in a difference tabular values, Interpolation with equal intervals: derivations of Newton's forward and Newton's backward interpolation formulae and their applications, Interpolation with unequal intervals: derivations of Newton's divided difference & Lagrange's Interpolation formulae and their applications.

Section – II

Central Difference interpolation formulae: derivations of Gauss's forward and Gauss's backward interpolation formulae, Sterling, Bessel formulae and their applications. Numerical Differentiation: Relation between difference operator and derivative operator, Derivative of a function using interpolation formulae (as studied in Sections – I & II). Numerical Integration: Newton-Cotes's Quadrature formula, Trapezoidal rule, Simpson's one- third rule and Simpson's three-eighth rule, Chebychev formula, Gauss Quadrature formula.

Section – III

Solution of Algebraic and Transcendental equations: Bisection method, Regula-Falsi method, Secant method, Newton-Raphson's method, Newton's iterative method for finding pth root of a number. Simultaneous linear algebraic equations: Gauss-elimination method, Gauss-Jordan method, Triangularization method (LU decomposition method). Iterative method, Jacobi's method, Gauss-Seidal's method, Relaxation method.

Section – IV

Eigen Value Problems: Power method, Jacobi's method, Given's method, House-Holder's method. Numerical solution of ordinary differential equations: Single step methods-Picard's method. Taylor's series method, Euler's method, Modified Euler's method, Runge-Kutta Methods. Multiple step methods; Predictor-corrector method, Milne-Simpson's method

Books Recommended:

1. Babu Ram, Numerical Methods: Pearson Publication.
2. R.S. Gupta, Elements of Numerical Analysis, Macmillan's India 2010.

3. M. K. Jain, S.R.K. Iyengar and R.K. Jain, Numerical Method, Problems and Solutions, New Age International (P) Ltd., 1996.
4. M. K. Jain, S.R.K. Iyengar and R.K. Jain, Numerical Method for Scientific and Engineering Computation, New Age International (P) Ltd., 1999
5. C. E. Froberg, Introduction to Numerical Analysis (2nd Edition).
6. Melvin J. Maaron, Numerical Analysis-A Practical Approach, Macmillan Publishing Co., Inc., New York
7. R.Y. Rubnistein, Simulation and the Monte Carlo Methods, John Wiley, 1981

CMP 310: Mathematics Lab-III

Marks (Total): 100

Time: 3 Hrs

Write down and execute the following programs using C-Programming Language

1. To interpolate the data using Newton's forward interpolation formula
2. To interpolate the data using Newton's backward interpolation formula
3. To interpolate the data using Gauss's forward interpolation formula
4. To interpolate the data using Gauss's backward interpolation formula
5. To interpolate the data using Lagrange's interpolation formula
6. To find the roots of algebraic and transcendental equations using Bisection method.
7. To find the roots of algebraic and transcendental equations using Regula-Falsi method.
8. To find the roots of algebraic and transcendental equations using Secant method.
9. To find the roots of algebraic and transcendental equations using Newton-Raphson's method.
10. To solve the system of linear equations using Gauss -elimination method.
11. To solve the system of linear equations using Gauss -Seidal iteration method.
12. To solve the system of linear equation using Gauss –jordan method.
13. To find the largest eigen value of a matrix by Power -method.
14. To integrate numerically using Trapezoidal rule.
15. To integrate numerically using Simpson's one- third rule.
16. To integrate numerically using Simpson's three-eighth rule.
17. To find numerical solution of ordinary differential equations by Euler's method/
Modified Euler's method.
18. To find numerical solution of ordinary differential equations by Runge -Kutta method.

BOOKS SUGGESTED:

1. Applied Numerical Analysis by Curtis F. Gerald and Patrick G. Wheatley – Pearson Education Ltd.
2. Numerical Methods: E. Balagurusamy, T.M.H.

Semester IV

CML 406: Partial Differential Equations & Special Functions

Marks (Theory): 80

Marks (Internal Assessment) : 20

Marks(Total) : 100

Time : 3Hrs

Note: Attempt five questions in all. The question paper will consist of **four** sections. **Question No. 1** will contain **seven** short answer type questions without any internal choice covering the entire syllabus and shall be **compulsory**. Each of the four sections (**I-IV**) will contain two questions and the students are required to attempt **one** question from each section. **All questions carry equal marks.**

Section – I

Partial differential equations: Formation, order and degree, Linear and Non-Linear Partial differential equations of the first order: Complete solution, singular solution, General solution, Solution of Lagrange's linear equations, Charpit's general method of solution. Compatible systems of first order equations, Jacobi's method.

Section – II

Linear partial differential equations of second and higher orders, Linear and non-linear homogeneous and non-homogeneous equations with constant coefficients, Partial differential equation with variable coefficients reducible to equations with constant coefficients, their complimentary functions and particular integrals, Equations reducible to linear equations with constant coefficients. Method of separation of variables: Solution of Laplace's equation, Wave equation (one and two dimensions), Diffusion (Heat) equation (one and two dimension) in Cartesian Co-ordinate system.

Section – III

Classification of linear partial differential equations of second order, hyperbolic, parabolic and elliptic types, Reduction of second order linear partial differential equations to Canonical (Normal) forms and their solutions, Solution of linear hyperbolic equations, Monge's method for partial differential equations of second order, Cauchy's problem for second order partial differential equations, Characteristic equations and characteristic curves of second order partial differential equation.

Section – IV

Series solution of differential equations – Power series method. Bessel equation and its solution: Bessel functions and their properties-Convergence, recurrence, Relations and generating functions, Orthogonality of Bessel functions. Legendre differential equation and its solution: Legendre function and its properties-Recurrence Relations and generating functions. Orthogonality of Legendre polynomial. Rodrigues' Formula for Legendre Polynomial.

Books Recommended:

1. D.A. Murray, Introductory Course on Differential Equations, Orient Longman, (India), 1967
2. Erwin Kreyszing, Advanced Engineering Mathematics, John Wiley & Sons, Inc., New York, 1999
3. A.R. Forsyth, A Treatise on Differential Equations, Macmillan and Co. Ltd.

4. Ian N. Sneddon, Elements of Partial Differential Equations, McGraw Hill Book Company, 1988
5. Frank Ayres, Theory and Problems of Differential Equations, McGraw Hill Book Company, 1972
6. J.N. Sharma and Kehar Singh, Partial Differential Equations
7. W.W. Bell, Special Functions for Scientists and Engineers.

CML-407 Mechanics-I

Theory: 80
Marks (Internal Assessment): 20

Marks (Total): 100
Time: 3 Hrs

Note: Attempt five questions in all. The question paper will consist of four sections. **Question No. 1** will contain **seven** short answer type questions without any internal choice covering the entire syllabus and shall be compulsory. Each of the four sections (**I-IV**) will contain two questions and the students are required to attempt one question from each section. All questions carry equal marks.

Section -I

Forces in two dimension (co-planner), triangle law and polygon law of forces, Lami's theorem, resultant of concurrent and coplanar forces, conditions of equilibrium of concurrent forces. Parallel forces: like parallel and unequal unlike parallel forces, resultant and centre of parallel forces; Moments and Couples.

Section -II

Forces in three dimensions, Poinso's central axis, conditions for the reduction of a general system of forces in space to a single force, equations of central axis, Wrenches: Definition and basic laws, resultant wrench of two wrenches, locus of the central axis of two wrenches; Null lines and null planes.

Section –III

Velocity and acceleration along a plane curve, component of velocity and acceleration in radial, transverse, tangential and normal directions, Relative velocity and acceleration. Simple harmonic motion (SHM).

Section- IV

Newton's laws of motion, Central Orbits, differential equations of Central Orbits in polar form and in pedal form, areal velocity, elliptic, hyperbolic and parabolic orbit, velocity in a circle, apse and apsidal distances: definition and laws, velocity from infinity, Kepler's laws of planetary motion, equivalence of Kepler's laws of planetary motion and Newton's law of gravitation, motion under the inverse square law.

Books Recommended:

1. S.L. Loney : Statics, Macmillan Company, London.
2. R.S. Verma: A Text Book on Statics, Pothishala Pvt. Ltd., Allahabad.
3. S.L. Loney, An Elementary Treatise on the Dynamics of a Particle and a Rigid Bodies, Cambridge University Press, 1956
4. F. Chorlton, Dynamics, CBS Publishers, New Delhi.
5. A.S. Ramsey, Dynamics Part-1&2, CBS Publisher & Distributors.

SEMESTER V & VI
B. SC. PHYSICAL SCIENCES
(PHYSICS)

CPL-501
Discipline Specific Course-I
Elements of Modern Physics
(Credits – 02, 30 Hrs (2 Hrs/week))

Marks for Major test (External): 80

Marks for internal Exam: 20

Time: 3 Hours

Paper setter is required to set nine questions in all. Question no. 1 is Compulsory and is based on the entire syllabus consisting of eight short answer type questions each of 2 marks. The remaining eight questions is to be set uniformly having two questions from each unit. The student is required to attempt five questions in all selecting one question from each unit and Question no. 1 is Compulsory, The paper will include at least 20% of total marks as numerical problems.

Course Objective	Course Outcome
The course on Elements of Modern Physics deals with Bohr Model, Fundamentals of Wave Mechanics, Heisenberg uncertainty principle, Schrodinger Equation and LASER.	The student will be able to understand Photo-electric effect and Compton scattering, calculation of energy levels for Hydrogen like atoms, Principle and working of LASER systems.

UNIT-I

Introduction to Quantisation: Properties of Thermal Radiation, Spectral Distribution of Blackbody Radiation, Kirchhoff's Law, Stefan-Boltzmann Law and Wien's Distribution and Displacement law, Rayleigh-Jean's Law, Ultraviolet Catastrophe, Planck's Quantum Postulates, Planck's Law of Blackbody Radiation: Experimental Verification.

Photo-electric effect and Compton scattering; Pair production and annihilation, Bremsstrahlung effect, Cherenkov radiation, Production of X-rays.

UNIT-II

Bohr Model: Drawbacks of Rutherford model, Bohr atomic model; Bohr's quantization rule and atomic stability; Calculation of energy levels for hydrogen like atoms and their spectra, Effect of nuclear mass on spectra, Correspondence principle.

Fundamentals of Wave Mechanics: De Broglie wavelength and matter waves; Wave-particle duality; Frank-Hertz, Davison and Germer experiment, phase velocity, group velocity and their relations.

UNIT-III

Heisenberg Uncertainty Principle; Estimating minimum energy of a confined particle using uncertainty principle; Energy-time uncertainty principle, Properties of wave-function, Physical Interpretation of wave-function.

Schrodinger Equation: Momentum and Energy operators, Stationary states, Physical interpretation of a wave function, probabilities and normalization, Schrodinger Equation, Particle in 1-dimension infinite potential well.

UNIT – IV

LASER: Absorption and emission of radiation (qualitative only); Basic features of LASER, Population inversion; Resonance cavity; laser pumping; threshold condition for laser emission; Einstein's Co-efficient, 3 level and 4 level system, Basic principle and working of He-Ne LASER and Ruby LASER, Applications of LASER.

Reference Books:

- Concepts of Modern Physics, Arthur Beiser, 2009, McGraw-Hill.
- Modern Physics, John R. Taylor, Chris D. Zafiratos, Michael A. Dubson, 2009, PHI Learning.
- Quantum Physics, Berkeley Physics Course Vol.4. E.H. Wichman, 2008, Tata McGraw-Hill Co.
- Modern Physics, R.A. Serway, C.J. Moses, and C.A. Moyer, 2005, Cengage Learning.

CPL-502

Discipline Specific Course-II Nuclear Physics (Credits – 02, 30 Hrs (2 Hrs/week))

Marks for Major test (External): 80

Marks for internal Exam: 20

Time: 3 Hours

Paper setter is required to set nine questions in all. Question no. 1 is Compulsory and is based on the entire syllabus consisting of eight short answer type questions each of 2 marks. The remaining eight questions is to be set uniformly having two questions from each unit. The student is required to attempt five questions in all selecting one question from each unit and Question no. 1 is Compulsory, The paper will include at least 20% of total marks as numerical problems.

Course Objective	Course Outcome
The course on Nuclear Physics deals with Basic Properties of Nuclei Radioactivity, Nuclear Models and nuclear forces, Radiation Interaction, Nuclear Reactions, Nuclear Radiation Detector and Nuclear Reactors.	The student will be able to understand Nuclear composition and nuclear properties, Nuclear models, Nuclear detectors and reactors.

UNIT-1

Basic Properties of Nuclei: Nuclear composition (p-e and p-n hypotheses), Nuclear properties; Nuclear mass, size, spin, parity, magnetic dipole moment, quadrupole moment (shape concept) and binding energy, nuclear binding energy curve.

Radioactivity: Law of Radioactive Decay, Half-life, Radioactive Series, α -decay: Range of α -particles, Geiger-Nuttall law and α -particle Spectra, β -decay, Energy Spectra and Neutrino Hypothesis, γ -decay : Origin of γ -rays.

UNIT-II

Nuclear Models and Nuclear Forces: Similarity between nuclear matter and liquid drop, Liquid Drop Model, Semi-classical Mass formula, Limitations of liquid drop model, Magic number, Experimental signature of shell structure in nuclei, Nuclear Shell Model (qualitative only) and its application, Meson Theory of Nuclear Forces.

UNIT -III

Radiation Interaction: Interaction of heavy charged particles (proton, Alpha particles etc.); Energy loss of heavy charged particle (Discussion of Bethe formula), Range of alpha particles. Interaction of light charged particle (Beta-particle), Interaction of Gamma Ray; Passage of Gamma radiations through matter (Photoelectric, Compton and pair production effect), Absorption of Gamma rays (Mass attenuation coefficient),

Nuclear Reactions: Types of nuclear reactions, Concept of reaction cross-section, Concept of Compound and Direct Reactions.

UNIT- IV

Nuclear Radiation Detectors: Gas filled counters; Ionization chamber, proportional counter, G.M. Counter (detailed study), Basic principle of scintillation counter and semiconductor detectors.

Nuclear Reactors: General aspects of reactor design, Nuclear fission reactor (Principle, construction, working and use) **Particle Accelerators:** Particle Accelerator facilities in India, Linear Accelerator, Cyclotron, Synchrotron

References:

- Concepts of Modern Physics by Arthur Beiser (McGraw-Hill Book Company, 1987)
- Nuclear Physics, S. B. Patel, New Age publication
- Introduction to the physics of nuclei and particles by R.A. Dunlap.(Singapore: Thomson Asia, 2004).
- Nuclear physics by Irving Kaplan. (Oxford & IBH, 1962).
- Introductory nuclear physics by Kenneth S. Krane.(John Wiley & Sons, 1988).

CPP- 508

Practical -V; Physics Lab--V (Credits: 02, 60 Hours (4hrs. per week))

Max marks: 100
Examination Time: 3 Hours

Note:

1. Each student should perform any seven experiments.
2. The students are required to calculate the error involved in a particular experiment.
3. For giving marks under Lab. Record each college will maintain practical assessment record by using the following procedure:-
 - i. Each student has to perform a minimum number of experiments prescribed in the syllabus.
 - ii. After completion of experiment, the teacher will check the note book and conduct Viva – voce of each student to find out how much theoretical and experimental concept the student has understood. Lab. record will be maintained by giving marks on his practical note-book.
4. To compute total marks for lab. performance, a separate register will be maintained. Each student will be assigned separate page on this register. Marks obtained by the student in different experiments will be entered. This record will be signed by the concerned teacher.
5. The laboratory 'record register' will be presented to each external examiner for Lab. Record marks. External examiners may verify the record randomly.

List of Experiments

1. Determine e/m by Thomson's method
2. Study the frequency response of C B transistor amplifier
3. To determine Hall coefficient of a semiconductor sample.
4. Measurement of energy band gap of Ge/Si by four probe method
5. (a) Draw the plateau using G M counter (b) Determine the mass attenuation coefficient by G M counter
6. Determine the wavelength of Na by Fresnel Byprism
7. Diameter of a Lycopodium powder using corona rings
8. Study double slit interference by He-Ne laser
9. Determine the diameter of a thin wire using (He-Ne Laser) diffraction method

Extended list of experiments that may be added in above list (Experiments based on Computer programming in FORTRAN language.)

1. Compute the product of two matrices of different dimension using DO loop
2. Numerical integration by Simpson 1/3 rule
3. Fitting of a straight line using Least-Square method

References:

- 1 Worsnop and Flint, Advanced Practical Physics
- 2 Nelkon M and Ogborn, Advanced Level Practical Physics, Heinemann Education Bookd Ltd, New Delhi
- 3 Srivastava S S and Gupta M K, Experiments in Electronics, Atma Ran & Sons, Delhi
- 4 Gupta S L and Kumar V, Practical Physics, Pragati Prakashan, Meerut.

CPL- 601
Discipline Specific Course-III
Solid State Physics
(Credits – 02, 30 Hrs (2 Hrs/week))

Marks for Major test (External): 80

Marks for internal Exam: 20

Time: 3 Hours

Paper setter is required to set nine questions in all. Question no. 1 is Compulsory and is based on the entire syllabus consisting of eight short answer type questions each of 2 marks. The remaining eight questions is to be set uniformly having two questions from each unit. The student is required to attempt five questions in all selecting one question from each unit and Question no. 1 is Compulsory, The paper will include at least 20% of total marks as numerical problems.

Course Objective	Course Outcome
The course on Solid State Physics deals with some important concepts of crystal structure, lattice vibrations, band theory, magnetic properties of matter and superconductivity.	The student will be able to understand the concept of crystal planes and Miller indices, Phonon, Curie law, Applications of Superconductivity.

UNIT-I

Crystal Structure I: Crystalline and glassy forms, liquid crystals, crystal structure, periodicity, lattice and basis, crystal translational vectors and axes. Unit cell and Primitive Cell, Wigner Seitz primitive Cell, symmetry operations for a two dimensional crystal, Bravais lattices in two and three dimensions. Crystal planes and Miller indices, Inter-planer spacing, Crystal structures of Zinc Sulphide, Silicon, Sodium Chloride and Diamond.

UNIT- II

Crystal Structure II: X-ray diffraction, Bragg's Law and experimental X-ray diffraction methods. K-space and reciprocal lattice and its physical significance, reciprocal lattice vectors, reciprocal lattice to a simple cubic lattice, b.c.c. and f.c.c.

Lattice vibrations: Phonon concept, Vibration of monoatomic and diatomic lattice, Acoustical and optical modes, Dispersion relation for phonons, Dulong and Petit's Law, Einstein and Debye theories of specific heat of solids, Debye T^3 law.

UNIT- III

Band Theory: Free electron gas models, Nearly free electron model, Bloch function, Kronig Penny model, Velocity and Effective mass of electron, Distinction between metals, semiconductors and insulators, Hall Effect

Magnetic Properties of Matter: Dia-, Para-, Ferromagnetic Materials, Classical Langevin Theory of dia - and Paramagnetic Domains, Curie's law.

UNIT- IV

Super Conductivity: Historical introduction, Survey of superconductivity, Super conducting systems, High T_c Super conductors, Isotopic Effect, Critical Magnetic Field, Meissner Effect, London Theory and Penetration Depth, Classification of Superconductors (type I and Type II), BCS Theory of Superconductivity, Flux quantization, Josephson Effect (AC and DC), Practical Applications of superconductivity and their limitations.

Reference Books:

- Solid State Physics, M.A. Wahab, Narosa Publication
- Solid state physics, S.O. Pillai, New Age Publication
- Introduction to Solid State Physics, Charles Kittel, 8th Edition, 2004, Wiley India Pvt. Ltd.
- Elements of Solid State Physics, J.P. Srivastava, 4th Edition, 2015, Prentice-Hall of India

CPL-602
Discipline Specific Course-IV
Quantum Mechanics
(Credits – 02, 30 Hrs (2 Hrs/week))

Marks for Major test (External): 80

Marks for internal Exam : 20

Time: 3 Hours

Paper setter is required to set nine questions in all. Question no. 1 is Compulsory and is based on the entire syllabus consisting of eight short answer type questions each of 2 marks. The remaining eight questions is to be set uniformly having two questions from each unit. The student is required to attempt five questions in all selecting one question from each unit and Question no. 1 is Compulsory, The paper will include at least 20% of total marks as numerical problems.

Course Objective	Course Outcome
The course on Quantum Mechanics deals with applications of Schrodinger equation, spectroscopic terms and Rotational and vibrational spectra of diatomic molecules	The student will be able to understand basic concepts of Quantum Mechanics, one dimensional Harmonic Oscillator problem, Coupling Schemes, Rotational and vibrational spectra of diatomic molecules.

UNIT -1

Basics of Quantum Mechanics: Wave function and its physical significance, Properties of wave-function, Orthogonality and Normalization of wave function, Time dependent Schrodinger wave equation, Time Independent Schrodinger Equation, Momentum and Energy operators; Hermitian Operators- Eigenvalue and Eigen functions, Commutator relations of various operators, Stationary states; Probabilities and normalization, Probability current densities and its relation to wavefunction, Expectation Values of Dynamical quantities, Particle in 1-dimension Infinite Square Well (Energy levels and general Wavefunction)

UNIT-2

Application of Schrodinger Wave Equation: Solution of Schrodinger Equation for the Finite Potential Well, 1-Dimension Harmonic Oscillator problem - Algebraic and Analytical solutions, Free particle and concept of group velocity, Tunneling through finite potential barrier - Examples of alpha decay and tunnel diodes (qualitative only), Generalized uncertainty principles for Position-Momentum and Energy

UNIT-3

Larmor's precession, Spectroscopic terms and their notation, Selection rule, Orbital magnetic dipole moment (Bohr magneton), Coupling scheme; LS or Russel-Saunders Coupling scheme and JJ coupling scheme, Pauli principal, Hyperfine structure of spectral lines and its origin, isotopic effect, Atom in external magnetic field; Normal Zeeman effect

UNIT-4

Rotational spectra of diatomic molecules as rigid rotator, energy levels, Rotational spectra of diatomic molecules as non-rigid rotator, Intensity of rotational lines, Vibrational spectra, Vibrational-Rotational, Raman and electronic spectra of molecules: Vibrational energy of diatomic molecules, Molecules as Harmonic Oscillator

Reference:

- Concepts of Modern Physics, Arthur Beiser, 2009, McGraw-Hill
- Quantum Mechanics, D.J. Griffith, Pearson Ltd.
- Quantum Mechanics, V. K. Jain
- Quantum Physics, Berkeley Physics Course Vol.4. E.H. Wichman, 2008, Tata McGraw-Hill Co.

CPP- 608

Practical -VI; Physics Lab--VI (Credits: 02, 60 Hours (4hrs. per week))

Max. Marks: 100
Examination Time: 3 Hours

Note:

1. Each student should perform any seven experiments.
2. The students are required to calculate the error involved in a particular experiment.
3. For giving marks under Lab. Record each college will maintain practical assessment record by using the following procedure:-
 - iii. Each student has to perform a minimum number of experiments prescribed in the syllabus.
 - iv. After completion of experiment, the teacher will check the note book and conduct Viva – voce of each student to find out how much theoretical and experimental concept the student has understood. Lab. record will be maintained by giving marks on his practical note-book.
4. To compute total marks for lab. performance, a separate register will be maintained. Each student will be assigned separate page on this register. Marks obtained by the student in different experiments will be entered. This record will be signed by the concerned teacher.
5. The laboratory 'record register' will be presented to each external examiner for Lab. Record marks. External examiners may verify the record randomly.

List of Experiments

1. Study the frequency response of C E transistor amplifier
2. Study the B H curve using oscilloscope
3. Experiments based on application of OPAMP
4. Determine the velocity of ultrasonic in the Kerosene oil
5. Photo electric effect:
 - I. Photo current vs Intensity.
 - II. Energy of photo electron vs frequency of light photon.
6. Determine the resolving power of a prism
7. Thickness of a thin paper using interference fringes in an air wedge
8. Determine the resolving power of a transmission grating

Extended list of experiments that may be added in above list (Experiments based on Computer programming in FORTRAN language.)

1. Using array variable, find out the average and standard deviation
2. Compute the sum of a finite series up to correct three decimal place
3. With the help of a program arrange the marks in ascending of descending order

References:

- 1 Worshnop and Flint, Advanced Practical Physics
- 2 Nelkon M and Ogborn, Advanced Level Practical Physics, Heinemann Education Bookd Ltd, New Delhi
- 3 Srivastava S S and Gupta M K, Experiments in Electronics, Atma Ran & Sons, Delhi
- 4 Gupta S L and Kumar V, Practical Physics, Pragati Prakashan, Meerut.

SEMESTER V & VI
B. SC. PHYSICAL SCIENCES
(GEOGRAPHY)

YET TO BE FINALISED

SEMESTER V&VI
B. SC. PHYSICAL SCIENCES
(CHEMISTRY)

Semester V

CCL-503(i)

Discipline Specific Course-I(i)

POLYMER CHEMISTRY-I

Credits: 02; 30 Hrs (2Hrs /week)

Marks for Major Test (External): 80

Marks for Internal Exam: 20

Time: 3Hrs

Note: The examiner is requested to set nine questions in all, selecting two questions from each UNIT and one compulsory question (Question No.1 based on entire syllabus will consist of eight short answer type questions each of two marks). The candidate is required to attempt five questions in all selecting one from each UNIT and the compulsory Question No.1.

UNIT-I

Introduction and history of polymeric materials:

Different schemes of classification of polymers, Polymer nomenclature, Molecular forces and chemical bonding in polymers, Texture of polymers.

Nature and structure of polymers-Structure Property relationships.

(7 Hours)

UNIT-II

Functionality and its importance:

Criteria for synthetic polymer formation, classification of polymerization processes, Relationships between functionality, extent of reaction and degree of polymerization. Bi-functional systems, Poly-functional systems.

Properties of Polymers (Physical, thermal, flow & mechanical properties).

(8 Hours)

UNIT-III

Brief introduction to preparation, structure, properties and application of the following polymers:

polyolefins, polystyrene and styrene copolymers, poly(vinyl chloride) and related polymers, poly(vinyl acetate) and related polymers, acrylic polymers, fluoro polymers, polyamides and related polymers.

(8 Hours)

UNIT-IV

Polycarbonates, Phenol formaldehyde resins (Bakelite, Novalac), polyurethanes, silicone polymers, polydienes, Conducting Polymers, [polyacetylene, polyaniline, poly(p-phenylene sulphide polypyrrole, polythiophene)].

(7 Hours)

Reference Books:

- Seymour, R.B. & Carraher, C.E. *Polymer Chemistry: An Introduction*, Marcel Dekker, Inc. New York, 1981.
- Odian, G. *Principles of Polymerization*, 4th Ed. Wiley, 2004.
- Billmeyer, F.W. *Textbook of Polymer Science*, 2nd Ed. Wiley Interscience, 1971.
- Ghosh, P. *Polymer Science & Technology*, Tata McGraw-Hill Education, 1991.
- Lenz, R.W. *Organic Chemistry of Synthetic High Polymers*. Interscience Publishers, New York, 1967.

CCL-504(i)
Discipline Specific Course-I(i)
POLYMER CHEMISTRY-II
Credits: 02; 30 Hrs (2Hrs /week)

Marks for Major Test (External): 80
Marks for Internal Exam: 20
Time: 3Hrs

Note: The examiner is requested to set nine questions in all, selecting two questions from each UNIT and one compulsory question (Question No.1 based on entire syllabus will consist of eight short answer type questions each of two marks). The candidate is required to attempt five questions in all selecting one from each UNIT and the compulsory Question No.1.

UNIT-I

Kinetics of Polymerization: Mechanism and kinetics of step growth, radical chain growth, ionic chain (both cationic and anionic) and coordination polymerizations, Mechanism and kinetics of copolymerization, polymerization techniques.

(8 Hours)

UNIT-II

Crystallization and crystallinity: Determination of crystalline melting point and degree of crystallinity, Morphology of crystalline polymers, Factors affecting crystalline melting point.

Glass transition temperature (T_g) and determination of T_g, Free volume theory, WLF equation, Factors affecting glass transition temperature (T_g).

(7 Hours)

UNIT-III

Determination of molecular weight of polymers (M_n , M_w , etc) by end group analysis, viscometry, light scattering and osmotic pressure methods. Molecular weight distribution and its significance. Polydispersity index.

(7 Hours)

UNIT-IV

Polymer Solution: Criteria for polymer solubility, Solubility parameter, Thermodynamics of polymer solutions, entropy, enthalpy, and free energy change of mixing of polymers solutions, Flory- Huggins theory, Lower and Upper critical solution temperatures.

(8 Hours)

Reference Books:

- Seymour, R.B.&Carraher, C.E. *Polymer Chemistry: An Introduction*, Marcel Dekker, Inc. New York, 1981.
- Odian, G. *Principles of Polymerization*, 4th Ed. Wiley, 2004.
- Billmeyer, F.W. *Textbook of Polymer Science*, 2nd Ed. Wiley Interscience, 1971.
- Ghosh, P. *Polymer Science & Technology*, Tata McGraw-Hill Education, 1991.
- Lenz, R.W. *Organic Chemistry of Synthetic High Polymers*. Interscience Publishers, New York, 1967.

CCP-509(i)
PRACTICAL-V(i)
CHEMISTRY DSC LAB V(i)
POLYMER CHEMISTRY
Credits: 02; 60Hrs (4 Hrs /week)

Marks (External): 100

Time: 6Hrs

I. Polymer synthesis

1. Free radical solution polymerization of styrene (St) / Methyl Methacrylate (MMA) / Methyl Acrylate (MA) / Acrylic acid (AA).
 - a. Purification of monomer
 - b. Polymerization using benzoyl peroxide (BPO) / 2,2'-azo-bisisobutyronitrile (AIBN)
2. Preparation of nylon 66/6
3. Interfacial polymerization, preparation of polyester from isophthaloyl chloride (IPC) and phenolphthalein
 - a. Preparation of IPC
 - b. Purification of IPC
 - c. Interfacial polymerization
4. Redox polymerization of acrylamide
5. Precipitation polymerization of acrylonitrile
6. Preparation of urea-formaldehyde resin
7. Preparation of novalac resin/resold resin
8. Microscale emulsion polymerization of poly(methylacrylate).

II. Polymer characterization

1. Determination of molecular weight by viscometry:
 - a. Polyacrylamide-aq. NaNO_2 solution
 - b. (Poly vinyl propylidene (PVP) in water
2. Determination of the viscosity-average molecular weight of poly(vinyl alcohol) (PVOH) and the fraction of "head-to-head" monomer linkages in the polymer.
3. Determination of molecular weight by end group analysis: Polyethylene glycol (PEG) (OH group).

III. Polymer analysis

1. Estimation of the amount of HCHO in the given solution by sodium sulphite method
2. Instrumental Techniques
3. Preparation of polyacrylamide and its electrophoresis

*at least 7 experiments to be carried out.

Reference Books:

- M.P. Stevens, *Polymer Chemistry: An Introduction*, 3rd Ed., Oxford University Press, 1999.
- H.R. Allcock, F.W. Lampe & J.E. Mark, *Contemporary Polymer Chemistry*, 3rd ed. Prentice-Hall (2003)
- F.W. Billmeyer, *Textbook of Polymer Science*, 3rded.Wiley-Interscience (1984)
- J.R. Fried, *Polymer Science and Technology*, 2nded.Prentice-Hall (2003)
- P. Munk& T.M. Aminabhavi, *Introduction to Macromolecular Science*, 2nded.John Wiley & Sons (2002)
- L. H. Sperling, *Introduction to Physical Polymer Science*, 4thed.John Wiley & Sons (2005)
- M.P. Stevens, *Polymer Chemistry: An Introduction*3rded.Oxford University Press (2005).
- Seymour/ Carraher's Polymer Chemistry, 9th ed.by Charles E. Carraher, Jr. (2013).

CCL-503(ii)
Discipline Specific Course-I(ii)
Chemistry of Main Group Elements, Theories of Acids and Bases-I
Credits: 02; 30 Hrs (2Hrs /week)

Marks for Major Test (External): 80

Marks for Internal Exam: 20

Time: 3Hrs

Note: The examiner is requested to set nine questions in all, selecting two questions from each UNIT and one compulsory question (Question No.1 based on entire syllabus will consist of eight short answer type questions each of two marks). The candidate is required to attempt five questions in all selecting one from each UNIT and the compulsory Question No.1.

UNIT-I

Acids and Bases: Bronsted–Lowry concept, conjugate acids and bases, relative strengths of acids and bases, effects of substituent and solvent, differentiating and levelling solvents. Lewis acid-base concept, classification of Lewis acids and bases, Lux-Flood concept and solvent system concept. Hard and soft acids and bases (HSAB concept), applications of HSAB process.

(7 Hours)

UNIT-II

General Principles of Metallurgy: Chief modes of occurrence of metals based on standard electrode potentials, Ellingham diagrams for reduction of metal oxides using carbon and carbon monoxide as reducing agents.

Hydrometallurgy with reference to cyanide process for gold and silver. Methods of purification of metals (Al, Pb, Ti, Fe, Cu, Ni, Zn, Au): electrolytic refining, zone refining, van Arkel-de Boer process, Parting Process, Mond's process and Kroll Process.

(8 Hours)

UNIT-III

s- and p-Block Elements

Periodicity in s- and p-block elements with respect to electronic configuration, atomic and ionic size, ionization enthalpy, electron gain enthalpy, electronegativity (Pauling scale).

General characteristics of s-block metals like density, melting and boiling points, flame colour and reducing nature.

Oxidation states of s- and p-block elements, inert-pair effect, diagonal relationships and anomalous behaviour of first member of each group. Allotropy in C, P and S.

(7 Hours)

UNIT-IV

Complex forming tendency of s block elements and a preliminary idea of crown ethers and cryptates, structures of basic beryllium acetate, salicylaldehyde/ acetylacetonato complexes of Group 1 metals.

Solutions of alkali metals in liquid ammonia and their properties.

Common features, such as ease of formation, solubility and stability of oxides, peroxides, superoxides, sulphates and carbonates of s-block metals.

(8 Hours)

Recommended texts:

- Lee, J.D. *Concise Inorganic Chemistry* ELBS, 1991.
- Cotton, F.A., Wilkinson, G. & Gaus, P.L. *Basic Inorganic Chemistry*, 3rd ed., Wiley.
- Douglas, B.E., McDaniel, D.H. & Alexander, J.J. *Concepts and Models in Inorganic Chemistry*, John Wiley & Sons.
- Greenwood, N.N. & Earnshaw. *Chemistry of the Elements*, Butterworth-Heinemann. 1997.
- Rodger, G.E. *Inorganic and Solid State Chemistry*, Cengage Learning India Edition, 2002.
- Miessler, G. L. & Donald, A. Tarr. *Inorganic Chemistry* 4th Ed., Pearson, 2010.
Atkin, P. *Shriver & Atkins' Inorganic Chemistry* 5th Ed. Oxford University Press (2010).

CCL-504(ii)
Discipline Specific Course-II(ii)
Chemistry of Main Group Elements-II
Credits: 02; 30 Hrs (2Hrs /week)

Marks for Major Test (External): 80

Marks for Internal Exam: 20

Time: 3Hrs

Note: The examiner is requested to set nine questions in all, selecting two questions from each UNIT and one compulsory question (Question No.1 based on entire syllabus will consist of eight short answer type questions each of two marks). The candidate is required to attempt five questions in all selecting one from each UNIT and the compulsory Question No.1.

UNIT-I

Structure, bonding and properties (acidic/ basic nature, oxidizing/ reducing nature and hydrolysis of the following compounds and their applications in industrial and environmental chemistry wherever applicable:

Diborane and concept of multicentre bonding, hydrides of Groups 13 (EH_3), 14, 15, 16 and 17.

Oxides of N and P, Oxoacids of P, S and Cl.

(8 Hours)

UNIT-II

Halides and oxohalides of P and S (PCl_3 , PCl_5 , SOCl_2 and SO_2Cl_2) Interhalogen compounds.

A brief idea of pseudohalides

(7 Hours)

UNIT-III

Noble gases: Rationalization of inertness of noble gases, clathrates, preparation and properties of XeF_2 , XeF_4 and XeF_6 , bonding in these compounds using VBT and shapes of noble gas compounds using VSEPR Theory

(7 Hours)

UNIT-IV

Inorganic Polymers: Types of inorganic polymers and comparison with organic polymers, structural features, classification and important applications of silicates. Synthesis, structural features and applications of silicones. Borazines and cyclophosphazenes – preparation, properties and reactions. Bonding in $(\text{N}(\text{PCl}_2)_3)_n$.

(8 Hours)

Recommended texts:

- Lee, J.D. *Concise Inorganic Chemistry* ELBS, 1991.
- Cotton, F.A., Wilkinson, G. & Gaus, P.L. *Basic Inorganic Chemistry*, 3rd ed., Wiley.
- Douglas, B.E., McDaniel, D.H. & Alexander, J.J. *Concepts and Models in Inorganic Chemistry*, John Wiley & Sons.
- Greenwood, N.N. & Earnshaw. *Chemistry of the Elements*, ButterworthHeinemann. 1997.
- Rodger, G.E. *Inorganic and Solid State Chemistry*, Cengage Learning India Edition, 2002.
- Miessler, G. L. & Donald, A. Tarr. *Inorganic Chemistry* 4th Ed., Pearson, 2010.
- Atkin, P. *Shriver & Atkins' Inorganic Chemistry* 5th Ed. Oxford University Press (2010).

CCP-509(ii)
PRACTICAL-V(ii)
CHEMISTRY DSC LAB V
Chemistry of Main Group Elements, Theories of Acids and Bases
Credits: 02; 60 Hrs (4 Hrs /week)

Marks (External): 100

Time: 6Hrs

1. Iodometric estimation of potassium dichromate and copper sulphate
2. Iodimetric estimation of antimony in tartaremetic
3. Estimation of amount of available chlorine in bleaching powder and household bleaches
4. Estimation of iodine in iodized salts.
5. Iodimetric estimation of ascorbic acid in fruit juices.
6. Estimation of dissolved oxygen in water samples.
7. Gravimetric estimation of sulphate as barium sulphate.
8. Gravimetric estimation of aluminium as oximato complex
9. Preparation of the following: potash alum, chrome alum, tetraamminecopper(II) sulphate monohydrate, potassium trioxalatoferrate(III) (any two, including one double salt and one complex).

Recommended Texts:

- Svehla, G. *Vogel's Qualitative Inorganic Analysis*, Pearson Education, 2012.
- Mendham, J. *Vogel's Quantitative Chemical Analysis*, Pearson, 2009.

CCS-505(i)
Skill Enhancement Course-I
PESTICIDE CHEMISTRY (Theory)
Credits: 02; 30 Hrs (2Hrs /week)

Total Marks: 100

Marks (External): 50

Examination Time: 2Hrs

Note: The examiner is requested to set five questions in all, selecting two questions from each UNIT and one compulsory question (Question No.1 based on entire syllabus will consist of ten short answer type questions each of two marks). The candidate is required to attempt three questions in all selecting one from each UNIT and the compulsory Question No.1.

UNIT-I

General introduction to pesticides (natural and synthetic), benefits and adverse effects, changing concepts of pesticides.

UNIT-II

Structure activity relationship, synthesis and uses of representative pesticides in the following classes: Organochlorines (DDT, Gammexene, Aldrin, Dieldrin); Organophosphates (Malathion, Parathion); Carbamates (Carbofuran and carbaryl); Quinones (Chloranil), Anilides (Alachlor and Butachlor).

Marks (Internal): 50

Skill Enhancement Course-I
PESTICIDE CHEMISTRY (Practicals)

1. To calculate acidity/alkalinity in given sample of pesticide formulations as per BIS specifications.
2. Preparation of simple organophosphates, phosphonates and thiophosphates

Reference Book

- Cremllyn, R. *Pesticides. Preparation and Modes of Action*, John Wiley & Sons, New York, 1978.

CCS-505(ii)
Skill Enhancement Course-III
FUEL CHEMISTRY (Theory)
Credits: 02; 30 Hrs (2Hrs /week)

Total Marks: 100

Marks (External): 50

Time: 2 Hrs

Note: The examiner is requested to set five questions in all, selecting two questions from each UNIT and one compulsory question (Question No.1 based on entire syllabus will consist of ten short answer type questions each of two marks). The candidate is required to attempt three questions in all selecting one from each UNIT and the compulsory Question No.1.

UNIT-I

Review of energy sources (renewable and non-renewable). Classification of fuels and their calorific value.

Coal: Uses of coal (fuel and nonfuel) in various industries, its composition, carbonization of coal. Coal gas, producer gas and water gas—composition and uses. Fractionation of coal tar, uses of coal tar bases chemicals, requisites of a good metallurgical coke, Coal gasification (Hydro gasification and Catalytic gasification), Coal liquefaction and Solvent Refining.

Petroleum and Petrochemical Industry: Composition of crude petroleum, Refining and different types of petroleum products and their applications.

UNIT-II

Fractional Distillation (Principle and process), Cracking (Thermal and catalytic cracking), Reforming Petroleum and non-petroleum fuels (LPG, CNG, LNG, bio-gas, fuels derived from biomass), fuel from waste, synthetic fuels (gaseous and liquids), clean fuels. Petrochemicals: Vinyl acetate, Propylene oxide, Isoprene, Butadiene, Toluene and its derivatives Xylene.

Lubricants: Classification of lubricants, lubricating oils (conducting and nonconducting) Solid and semisolid lubricants, synthetic lubricants.
Properties of lubricants (viscosity index, cloud point, pore point) and their determination.

Marks (Internal): 50

**Skill Enhancement Course-III
FUEL CHEMISTRY (Practicals)**

Properties of lubricants (viscosity index, cloud point, pore point) and their determination.

Reference Books:

- Stocchi, E. *Industrial Chemistry*, Vol-I, Ellis Horwood Ltd. UK (1990).
- Jain, P.C. & Jain, M. *Engineering Chemistry* Dhanpat Rai & Sons, Delhi.
- Sharma, B.K. & Gaur, H. *Industrial Chemistry*, Goel Publishing House, Meerut (1996).

Semester VI
CCL-603(i)
Discipline Specific Course-III(i)
ORGANOMETALLICS AND BIOINORGANIC CHEMISTRY
Credits: 02; 30 Hrs (2Hrs /week)

Marks for Major Test (External): 80

Marks for Internal Exam: 20

Time: 3Hrs

Note: The examiner is requested to set nine questions in all, selecting two questions from each UNIT and one compulsory question (Question No.1 based on entire syllabus will consist of eight short answer type questions each of two marks). The candidate is required to attempt five questions in all selecting one from each UNIT and the compulsory Question No.1.

UNIT-I

Chemistry of 3d metals

Oxidation states displayed by Cr, Fe, Co, Ni and Co.

A study of the following compounds (including preparation and important properties);

Peroxo compounds of Cr, $K_2Cr_2O_7$, $KMnO_4$, $K_4[Fe(CN)_6]$, sodium nitroprusside, $[Co(NH_3)_6]Cl_3$, $Na_3[Co(NO_2)_6]$.

(8 Hours)

UNIT-II

Organometallic Compounds

Definition and Classification with appropriate examples based on nature of metalcarbon bond (ionic, s, p and multicentre bonds). Structures of methyl lithium, Zeiss salt and ferrocene. EAN rule as applied to carbonyls.

(7 Hours)

UNIT-III

Preparation, structure, bonding and properties of mononuclear and polynuclear carbonyls of 3d metals. p-acceptor behaviour of carbon monoxide. Synergic effects (VB approach)-(MO diagram of CO can be referred to for synergic effect to IR frequencies).

(7 Hours)

UNIT-IV

Bio-Inorganic Chemistry

A brief introduction to bio-inorganic chemistry. Role of metal ions present in biological systems with special reference to Na^+ , K^+ and Mg^{2+} ions: Na/K pump; Role of Mg^{2+} ions in energy production and chlorophyll. Role of Ca^{2+} in blood clotting, stabilization of protein structures and structural role (bones).

(8 Hours)

Reference Books:

- James E. Huheey, Ellen Keiter & Richard Keiter: *Inorganic Chemistry: Principles of Structure and Reactivity*, Pearson Publication.
- G.L. Miessler & Donald A. Tarr: *Inorganic Chemistry*, Pearson Publication.
- J.D. Lee: *A New Concise Inorganic Chemistry*, E.L.B.S.
- F.A. Cotton & G. Wilkinson: *Basic Inorganic Chemistry*, John Wiley & Sons.

CCL-604(i)
Discipline Specific Course-IV(i)
POLYNUCLEAR HYDROCARBONS AND UV, IR SPECTROSCOPY
Credits: 02; 30 Hrs (2Hrs /week)

Marks for Major Test (External): 80

Marks for Internal Exam: 20

Time: 3Hrs

Note: The examiner is requested to set nine questions in all, selecting two questions from each UNIT and one compulsory question (Question No.1 based on entire syllabus will consist of eight short answer type questions each of two marks). The candidate is required to attempt five questions in all selecting one from each UNIT and the compulsory Question No.1.

UNIT-I

Polynuclear and heteronuclear aromatic compounds:

Properties of the following compounds with reference to electrophilic and nucleophilic substitution: Naphthalene, Anthracene, Furan, Pyrrole, Thiophene, and Pyridine.

(8 Hours)

UNIT-II

Active methylene compounds:

Preparation: Claisen ester condensation. Keto-enol tautomerism.

Reactions: Synthetic uses of ethyl acetoacetate (preparation of non-hetero molecules having upto 6 carbon).

(7 Hours)

UNIT-III

Application of Spectroscopy to Simple Organic Molecules

Application of visible, ultraviolet and infrared spectroscopy in organic molecules. Electromagnetic radiations, electronic transitions, $\lambda_{\max}$ & $\epsilon_{\max}$, chromophore, auxochrome, bathochromic and hypsochromic shifts. Application of electronic spectroscopy and Woodward rules for calculating $\lambda_{\max}$ of conjugated dienes and α,β -unsaturated compounds.

(7 Hours)

UNIT-IV

Infrared radiation and types of molecular vibrations, functional group and fingerprint region. IR spectra of alkanes, alkenes and simple alcohols (inter and intramolecular hydrogen bonding), aldehydes, ketones, carboxylic acids and their derivatives (effect of substitution on $>C=O$ stretching absorptions).

(8 Hours)

Reference Books:

- I.L. Finar: *Organic Chemistry* (Vol. I & II), E.L.B.S.
- John R. Dyer: *Applications of Absorption Spectroscopy of Organic Compounds*, Prentice Hall.
- R.M. Silverstein, G.C. Bassler & T.C. Morrill: *Spectroscopic Identification of Organic Compounds*, John Wiley & Sons.
- R.T. Morrison & R.N. Boyd: *Organic Chemistry*, Prentice Hall.
- Peter Sykes: *A Guide Book to Mechanism in Organic Chemistry*, Orient Longman.
- ArunBahl and B. S. Bahl: *Advanced Organic Chemistry*, S. Chand.

CCP-609(i)
PRACTICAL-VI(i)
CHEMISTRY DSC LAB VI
Organometallics, Bioinorganic Chemistry, Polynuclear Hydrocarbons
and UV, IR Spectroscopy
Credits: 02; 60 Hrs (4Hrs /week)

Marks (External): 100

Time: 6Hrs

Section A: Inorganic Chemistry

1. Separation of mixtures by chromatography: Measure the R_f value in each case. (Combination of two ions to be given)
 - a. Paper chromatographic separation of Fe^{3+} , Al^{3+} and Cr^{3+} or
 - b. Paper chromatographic separation of Ni^{2+} , Co^{2+} , Mn^{2+} and Zn^{2+}
2. Preparation of any two of the following complexes and measurement of their conductivity:
 - a. tetraamminecarbonatocobalt (III) nitrate
 - b. tetraamminecopper (II) sulphate
 - c. potassium trioxalatoferrate (III) trihydrate

Compare the conductance of the complexes with that of M/1000 solution of NaCl, MgCl_2 and LiCl_3 .

Section B: Organic Chemistry

Systematic Qualitative Organic Analysis of Organic Compounds possessing monofunctional groups (-COOH, phenolic, aldehydic, ketonic, amide, nitro, amines) and preparation of one derivative.

Reference Books:

- A.I. Vogel: Qualitative Inorganic Analysis, Prentice Hall, 7th Edn.
- A.I. Vogel: Quantitative Chemical Analysis, Prentice Hall, 6th Edn.
- Vogel, A.I., Tatchell, A.R., Furnis, B.S., Hannaford, A.J. & Smith, P.W.G., *Textbook of Practical Organic Chemistry*, Prentice-Hall, 5th edition, 1996.
- Mann, F.G. & Saunders, B.C. *Practical Organic Chemistry* Orient-Longman, 1960.

CCL-603(ii)
Discipline Specific Course-III(ii)
QUANTUM CHEMISTRY
Credits: 02; 30 Hrs (2Hrs /week)

Marks for Major Test (External): 80

Marks for Internal Exam: 20

Time: 3Hrs

Note: The examiner is requested to set nine questions in all, selecting two questions from each UNIT and one compulsory question (Question No.1 based on entire syllabus will consist of eight short answer type questions each of two marks). The candidate is required to attempt five questions in all selecting one from each UNIT and the compulsory Question No.1.

UNIT-I

Postulates of quantum mechanics, quantum mechanical operators, Schrödinger equation and its application to free particle and "particle-in-a-box" (rigorous treatment), quantization of energy levels, zero-point energy and Heisenberg Uncertainty principle; wavefunctions, probability distribution functions, nodal properties, Extension to two and three dimensional boxes, separation of variables, degeneracy.

(8 Hours)

UNIT-II

Qualitative treatment of simple harmonic oscillator model of vibrational motion: Setting up of Schrödinger equation and discussion of solution and wave functions. Vibrational energy of diatomic molecules and zero-point energy.

Angular momentum: Commutation rules, quantization of square of total angular momentum and z-component.

Rigid rotator model of rotation of diatomic molecule. Schrödinger equation.

(7 Hours)

UNIT-III

Qualitative treatment of hydrogen atom and hydrogen-like ions: setting up of Schrödinger equation in spherical polar coordinates, radial part, quantization of energy (only final energy expression). Average and most probable distances of electron from nucleus.

Setting up of Schrödinger equation for many-electron atoms (He, Li). Need for approximation methods. Statement of variation theorem and application to simple systems (particle-in-a-box, harmonic oscillator, hydrogen atom).

(7 Hours)

UNIT-IV

Chemical bonding: Covalent bonding, valence bond and molecular orbital approaches, LCAO-MO treatment of H_2^+ . Bonding and antibonding orbitals. Qualitative extension to H_2 . Comparison of LCAO-MO and VB treatments of H_2 (only wavefunctions, detailed solution not required) and their limitations. Refinements of the two approaches (Configuration Interaction for MO, ionic terms in VB). Qualitative description of LCAO-MO treatment of homonuclear and heteronuclear diatomic molecules (HF, LiH).

(8 Hours)

Reference Books:

- Chandra, A. K. *Introductory Quantum Chemistry* Tata McGraw-Hill (2001).
- House, J. E. *Fundamentals of Quantum Chemistry* 2nd Ed. Elsevier: USA (2004).
- Lowe, J. P. & Peterson, K. *Quantum Chemistry*, Academic Press (2005).

CCL-604(ii)
Discipline Specific Course-IV(ii)
SPECTROSCOPY & PHOTOCHEMISTRY
Credits: 02; 30 Hrs (2Hrs /week)

Marks for Major Test (External): 80

Marks for Internal Exam: 20

Time: 3Hrs

Note: The examiner is requested to set nine questions in all, selecting two questions from each UNIT and one compulsory question (Question No.1 based on entire syllabus will consist of eight short answer type questions each of two marks). The candidate is required to attempt five questions in all selecting one from each UNIT and the compulsory Question No.1.

UNIT-I

Molecular Spectroscopy:

Interaction of electromagnetic radiation with molecules and various types of spectra; Born-Oppenheimer approximation.

Rotation spectroscopy: Selection rules, intensities of spectral lines, determination of bond lengths of diatomic and linear triatomic molecules, isotopic substitution.

Vibrational spectroscopy: Classical equation of vibration, computation of force constant, amplitude of diatomic molecular vibrations, anharmonicity, Morse potential, dissociation energies, fundamental frequencies, overtones, hot bands, degrees of freedom for polyatomic molecules, modes of vibration, concept of group frequencies. Vibration-rotation spectroscopy: diatomic vibrating rotator, P, Q, R branches.

(8 Hours)

UNIT-II

Raman spectroscopy: Qualitative treatment of Rotational Raman effect; Effect of nuclear spin, Vibrational Raman spectra, Stokes and anti-Stokes lines; their intensity difference, rule of mutual exclusion.

Electronic spectroscopy: Franck-Condon principle, electronic transitions, singlet and triplet states, fluorescence and phosphorescence, dissociation and predissociation, calculation of electronic transitions of polyenes using free electron model.

(7 Hours)

UNIT-III

Nuclear Magnetic Resonance (NMR) spectroscopy: Principles of NMR spectroscopy, Larmor precession, chemical shift and low resolution spectra, different scales, spin-spin coupling and high resolution spectra, interpretation of PMR spectra of organic molecules.

Electron Spin Resonance (ESR) spectroscopy: Its principle, hyperfine structure, ESR of simple radicals.

(8 Hours)

UNIT-IV

Photochemistry

Characteristics of electromagnetic radiation, Lambert-Beer's law and its limitations, physical significance of absorption coefficients. Laws of photochemistry, quantum yield, actinometry, examples of low and high quantum yields, photochemical equilibrium and the differential rate of photochemical reactions, photosensitized reactions, quenching. Role of photochemical reactions in biochemical processes, photostationary states, chemiluminescence.

(7 Hours)

Reference Books:

- Banwell, C. N. & McCash, E. M. *Fundamentals of Molecular Spectroscopy* 4th Ed. Tata McGraw-Hill: New Delhi (2006).
- Kakkar, R. *Atomic & Molecular Spectroscopy: Concepts & Applications*, Cambridge University Press (2015).

CCP-609(ii)
Practical-VI(ii)
CHEMISTRY DSE LAB 6B: QUANTUM CHEMISTRY, SPECTROSCOPY & PHOTOCHEMISTRY
Credits: 02; 60 Hrs (4Hrs /week)

Marks (External): 100

Time: 6Hrs

UV/Visible spectroscopy

1. Study the 200-500 nm absorbance spectra of KMnO_4 and $\text{K}_2\text{Cr}_2\text{O}_7$ (in 0.1 M H_2SO_4) and determine the λ_{max} values. Calculate the energies of the two transitions in different units (J molecule^{-1} , kJ mol^{-1} , cm^{-1} , eV).
2. Study the pH-dependence of the UV-Vis spectrum (200-500 nm) of $\text{K}_2\text{Cr}_2\text{O}_7$.
3. Record the 200-350 nm UV spectra of the given compounds (acetone, acetaldehyde, 2-propanol, acetic acid) in water. Comment on the effect of structure on the UV spectra of organic compounds.

Colorimetry

1. Verify Lambert-Beer's law and determine the concentration of $\text{CuSO}_4 / \text{KMnO}_4 / \text{K}_2\text{Cr}_2\text{O}_7$ in a solution of unknown concentration
2. Determine the concentrations of KMnO_4 and $\text{K}_2\text{Cr}_2\text{O}_7$ in a mixture.
3. Study the kinetics of iodination of propanone in acidic medium.
4. Determine the amount of iron present in a sample using 1,10-phenanthroline.
5. Determine the dissociation constant of an indicator (phenolphthalein).
6. Analyse the given vibration-rotation spectrum of HCl(g)

Reference Books

- Mendham, J. *Vogel's Quantitative Chemical Analysis*, Pearson, 2009.
- Khosla, B. D.; Garg, V. C. & Gulati, A., *Senior Practical Physical Chemistry*, R. Chand & Co.: New Delhi (2011).
- Garland, C. W.; Nibler, J. W. & Shoemaker, D. P. *Experiments in Physical Chemistry* 8th Ed.; McGraw-Hill: New York (2003).
- Halpern, A. M. & McBane, G. C. *Experimental Physical Chemistry* 3rd Ed.; W.H. Freeman & Co.: New York (2003).

SEMESTER V & VI
B. SC. PHYSICAL SCIENCES
(ELECTRONICS)

Semester V
CEL 503 (i)
Discipline Specific Course I (Electronics)
Electronic Instrumentation - I
(Credits: 02; 30 Hrs (2Hrs /week))

Marks for Major Test (External): 80

Marks for Internal Exam: 20

Time: 3 Hours

Paper setter is required to set nine questions in all. Question no. 1 is Compulsory and is based on the entire syllabus consisting of eight to ten short answer type questions each of 2 marks. The remaining eight questions is to be set uniformly having two questions from each unit. The student is required to attempt five questions in all selecting one question from each unit and Question no. 1 is Compulsory wherein student is required to attempt 8 parts.

UNIT-I

(8 Hours)

Measurements:

Accuracy and precision. Significant figures. Error and uncertainty analysis. Shielding and grounding. Electromagnetic Interference.

Basic Measurement Instruments:

DC measurement-ammeter, voltmeter, ohm meter, AC measurement, Digital voltmeter systems (integrating and non-integrating). Digital Multimeter - Block diagram principle of measurement of I, V, C. Accuracy and resolution of measurement.

UNIT-II

(7 Hours)

Basic Measurement Instruments:

Measurement of Impedance (A.C. bridges), Measurement of Self Inductance (Anderson's bridge), Measurement of Capacitance (De Sauty's bridge), Measurement of frequency (Wien's bridge).

UNIT-III

(7 Hours)

Oscilloscope:

Block Diagram, CRT, Vertical Deflection, Horizontal Deflection. Screens for CRT, Oscilloscope probes, measurement of voltage, frequency and phase by Oscilloscope. Digital Storage Oscilloscopes. LCD display for instruments.

Signal Generators:

Function generator, Pulse Generator, (Qualitative only).

UNIT-IV

(8 Hours)

Power supply:

Block Diagram of a Power Supply, Qualitative idea of C and L Filters. IC Regulators (78XX and 79XX), Line and load regulation, Short circuit protection. Idea of switched mode power supply (SMPS) and uninterrupted power supply (UPS).

Reference Books:

- David A. Bell, Electronic Devices and Circuits, Oxford University Press (2015).
- W.D. Cooper and A. D. Helfrick, Electronic Instrumentation and Measurement Techniques, Prentice Hall (2005).
- E.O. Doebelin, Measurement Systems: Application and Design, McGraw Hill Book -fifth Edition (2003).
- A Course in Electrical and Electronic Measurement and instrumentation, A K Sawhney, Dhanpat Rai
- Alan S. Morris, "Measurement and Instrumentation Principles", Elsevier (Butterworth Heinmann-2008).
- S. Rangan, G. R. Sarma and V. S. Mani, Instrumentation Devices and Systems, Tata Mcgraw Hill (1998).
- Introduction to measurements and instrumentation, 4th Edn., Ghosh, PHI Learning

CEL 503 (ii)
Discipline Specific Course I (Electronics)
Signal and System

(Credits: 02; 30 Hrs (2Hrs /week))

Marks for Major Test (External): 80

Marks for Internal Exam: 20

Time: 3 Hours

Paper setter is required to set nine questions in all. Question no. 1 is Compulsory and is based on the entire syllabus consisting of eight to ten short answer type questions each of 2 marks. The remaining eight questions is to be set uniformly having two questions from each unit. The student is required to attempt five questions in all selecting one question from each unit and Question no. 1 is Compulsory wherein student is required to attempt 8 parts.

UNIT-I

(8 Hours)

Introduction to Signal

Classification of Signals, Basic operations: Time Shifting, Time Reversal, Time Scaling, Signal representation in terms of singular functions, Correlation of Signals and its Properties, Representation of a Continuous-Time Signal by its Samples: The Sampling Theorem, Reconstruction, Aliasing.

UNIT-II

(7 Hours)

System & its Properties

classification of Systems: Linear & Nonlinear ; Static & Dynamic , Causal & Non-causal , Stable & Unstable System, Time variant & Time Invariant Systems with examples,
Linear Time-Invariant Systems: Definition and Properties, Impulse Response, Representation of LTI systems using Differential and Difference equations.

UNIT-III

(7 Hours)

Fourier Series:

Introduction to Frequency domain Representation, Fourier Series Representation of Periodic Signals, Convergence of Fourier Series, Properties of Fourier Series

UNIT-IV

(8 Hours)

Fourier Transform:

Need for Fourier Transform, Fourier Transform for periodic and Aperiodic signals, Convergence of Fourier Transform, Properties of Fourier Transform, Applications of Fourier Transform.

Reference Books:

- Signals and systems, A. V. Oppenheim, A. S. Willsky, PHI
- Signals and systems, Tarun K. Rawat, Oxford University Press.
- Signals & Systems, Farooq Husain, Umesh Publications.
- Digital Signal Processing, S. Salivahanan, A. Vallavraj, Tata McGraw Hill.
- Principles of Signal Processing and Linear Systems, B.P. Lathi, Oxford University Press.
- Fundamentals of Digital Signal processing using MATLAB, R.J. Schilling and S.L. Harris, 2005, Cengage Learning.
- Fundamentals of signals and systems, P.D. Cha and J.I. Molinder, 2007, Cambridge University Press.
- Digital Signal Processing Principles Algorithm & Applications, J.G. Proakis and D.G. Manolakis, 2007, 4th Edition, Prentice Hall.
- K.A. Navas and R Jayadevan, Lab Primer Through MATLAB, PHI

CEL 503 (iii)
Discipline Specific Course I (Electronics)
Semiconductor Devices Fabrication
(Credits: 02; 30 Hrs (2Hrs /week)))

Marks for Major Test (External): 80

Marks for Internal Exam: 20

Time: 3 Hours

Paper setter is required to set nine questions in all. Question no. 1 is Compulsory and is based on the entire syllabus consisting of eight to ten short answer type questions each of 2 marks. The remaining eight questions is to be set uniformly having two questions from each unit. The student is required to attempt five questions in all selecting one question from each unit and Question no. 1 is Compulsory wherein student is required to attempt 8 parts.

UNIT-I

(7 Hours)

Introduction of Semiconductor Process Technology: Semiconductor materials, Crystal growth techniques- Czochralski technique, Float Zone Process, Wafer preparation, Clean room.

Oxidation: Thermal oxidation process- Kinetics of growth for thick and thin oxide, Dry and Wet oxidation. Effects of high pressure and impurities, Impurity redistribution during oxidation, Masking property of silicon oxide, Chemical vapour deposition of silicon oxide, Properties of silicon oxide, Step coverage, P-glass flow.

UNIT-II

(7 Hours)

Etching: Wet chemical etching- Basic process and few examples of etchants for semiconductors, insulators and conductors, Dry etching using plasma etching technique.

Epitaxy Deposition: Epitaxial growth by vapor phase epitaxy (VPE) and molecular beam epitaxy (MBE). **Diffusion:** Basic diffusion process- Diffusion equation, Diffusion profiles, Extrinsic diffusion concentration dependent diffusivity, Lateral diffusion, Doping through Ion implantation and its comparison with diffusion.

UNIT-III

(8 Hours)

Lithographic Processes: Optical lithography, Exposure tools, Masks, Photoresist, Pattern Transfer, Resolution Enhancement Techniques- Electron beam lithography, X-ray lithography and Ion beam lithography, Comparison between various lithographic techniques.

Metallization: Uses of Physical Vapor Deposition and Chemical Vapor Deposition technique for Aluminum and Copper metallization.

UNIT-IV

(7 Hours)

Process Integration: Passive components- Integrated circuit resistor, Integrated circuit inductor, Integrated circuit capacitor, MOSFET technology-Basic fabrication process of NMOS, PMOS and CMOS technology.

Characterization: introduction to Various characterization methods for structural, electrical and optical properties, Basic idea of X-ray diffractometer (XRD), Scanning electron microscope, (SEM) Transmission electron microscope(TEM) and UV-VIS-NIR spectrophotometer (Atomic force microscopy).

Reference Books:

- Physics of Semiconductor Devices, S. M. Sze. Wiley-Interscience.
- VLSI Fabrication Principles (Si and GaAs), S.K. Gandhi, John Wiley & Sons, Inc.
- Basic VLSI Design, D A Pucknell, PHI.
- Silicon VLSI Technology, James Plummer, Pearson
- Handbook of Thin Film Technology, Leon I. Maissel and Reinhard Glang.
- Fundamentals of Semiconductor Fabrication, S.M. Device and G. S. May, John-Wiley
- The science and Engineering of Microelectronics Fabrication, Stephen A. Campbell, 2010, Oxford University Press.
- Introduction to Semiconductor materials and Devices, M. S. Tyagi, John Wiley & Sons

CEL 504 (i)
Discipline Specific Course II (Electronics)
Electronic Instrumentation - II
(Credits: 02; 30 Hrs (2Hrs /week))

Marks for Major Test (External): 80

Marks for Internal Exam: 20

Time: 3 Hours

Paper setter is required to set nine questions in all. Question no. 1 is Compulsory and is based on the entire syllabus consisting of eight to ten short answer type questions each of 2 marks. The remaining eight questions is to be set uniformly having two questions from each unit. The student is required to attempt five questions in all selecting one question from each unit and Question no. 1 is Compulsory wherein student is required to attempt 8 parts.

UNIT-I

(8 Hours)

Lock-in-amplifier:

Basic Principles of phase locked loop (PLL), Phase detector (XOR & edge triggered), Voltage Controlled Oscillator (Basics, varactor), lock and capture. Basic idea of PLL IC (565 or 4046). Lock-in-amplifier, Idea of techniques for sum and averaging of signals.

UNIT-II

(7 Hours)

Virtual Instrumentation:

Introduction, Interfacing techniques (RS 232, GPIB, USB), Idea about Arduino microcontroller and interfacing software like LABVIEW.

UNIT-III

(8 Hours)

Transducers:

Classification of transducers, Basic requirement/characteristics of transducers, Active and Passive transducers, Resistive (Potentiometer- Theory, temperature compensation & applications) and Capacitive (variable air gap type) transducers

UNIT-IV

(7 Hours)

Transducers:

Inductive (LVDT) & piezoelectric transducers. Measurement of temperature (RTD, semiconductor IC sensors), Light transducers (photo resistors & photovoltaic cells).

Reference Books:

- David A. Bell, Electronic Devices and Circuits, Oxford University Press (2015).
- W.D. Cooper and A. D. Helfrick, Electronic Instrumentation and Measurement Techniques, Prentice Hall (2005).
- E.O. Doebelin, Measurement Systems: Application and Design, McGraw Hill Book -fifth Edition (2003).
- A Course in Electrical and Electronic Measurement and instrumentation, A K Sawhney, Dhanpat Rai
- Alan S. Morris, "Measurement and Instrumentation Principles", Elsevier (Butterworth Heinmann-2008).
- S. Rangan, G. R. Sarma and V. S. Mani, Instrumentation Devices and Systems, Tata Mcgraw Hill (1998).
- Introduction to measurements and instrumentation, 4th Edn., Ghosh, PHI Learning

CEL 504 (ii)
Discipline Specific Course II (Electronics)
Programming with Scilab/Matlab
(Credits: 02; 30 Hrs (2Hrs /week))

Marks for Major Test (External): 80

Marks for Internal Exam: 20

Time: 3 Hours

Paper setter is required to set nine questions in all. Question no. 1 is Compulsory and is based on the entire syllabus consisting of eight to ten short answer type questions each of 2 marks. The remaining eight questions is to be set uniformly having two questions from each unit. The student is required to attempt five questions in all selecting one question from each unit and Question no. 1 is Compulsory wherein student is required to attempt 8 parts.

UNIT-I

(8 Hours)

Basics:

environment, Basic computer programming, Variables and constants, operators and simple calculations, Formulas and functions, toolboxes.

Matrices and Vectors:

Matrix and linear algebra review, Vectors and matrices, Matrix operations and functions

UNIT-II

(7 Hours)

Programming:

script file and function file (m-files), If-else statement, For loop, while loop, 2d Plotting, 3d plotting

UNIT-III

(7 Hours)

Statistics programming

Mean and median of a vector, standard deviation and variance of a vector, largest element of a vector, percentiles

UNIT-IV

(8 Hours)

image processing: Basic idea of digital images, Basic image processing, image arithmetic, adding noise to images, filtering

Numerical Analysis : Numerical integration, differentiation, ordinary differential equation

Reference Books:

- Hema Ramachandran, Achuthsankar S. Nair, SciLab : A free software to Matlab, S Chand
- Tejas Seth, SciLab : A practical introduction to programming and problem solving
- Rachna Verma, Arvind Verma, Introduction to Scilab
- Rudra Pratap, Getting started with MATLAB, Oxford
- Amos Gilat, MATLAB: An Introduction with applications, Wiley
- Raj Kumar Bansal, Ashok Kumar Goyal, MATLAB and its application in engineering, Pearson

CEL 504 (iii)
Discipline Specific Course II (Electronics);
Antenna Theory
(Credits: 02; 30 Hrs (2Hrs /week))

Marks for Major Test (External): 80

Marks for Internal Exam: 20

Time: 3 Hours

Paper setter is required to set nine questions in all. Question no. 1 is Compulsory and is based on the entire syllabus consisting of eight to ten short answer type questions each of 2 marks. The remaining eight questions is to be set uniformly having two questions from each unit. The student is required to attempt five questions in all selecting one question from each unit and Question no. 1 is Compulsory wherein student is required to attempt 8 parts.

UNIT-I

(7 Hours)

Introduction:

Antenna as an element of wireless communication system, Antenna radiation mechanism, Types of Antennas, Fundamentals of EMFT: Maxwell's equations and their applications to antennas.

UNIT-II

(8 Hours)

Antenna Parameters:

Antenna parameters: Radiation pattern (polarization patterns, Field and Phase patterns), Field regions around antenna, Radiation intensity, Beamwidth, Gain, Directivity, Polarization, Bandwidth, Efficiency and Antenna temperature.

UNIT-III

(8 Hours)

Antenna as a Transmitter/Receiver:

Effective Height and Aperture, Power delivered to antenna, Input impedance. Radiation from an infinitesimal small current element, Radiation from an elementary dipole (Hertzian dipole), Reactive, Induction and Radiation fields, Power density and radiation resistance for small current element and half wave dipole antenna.

UNIT-IV

(7 Hours)

Radiating wire Structures :

Monopole, Dipole, Folded dipole, Loop antenna and Biconical broadband Antenna. Basics of Patch Antenna and its design. Examples of Patch antenna like bowtie, sectoral, fractal, etc.

Reference Books:

- Constantine A. Ballanis, Antenna Theory, John Wiley & Sons
- John Kraus, Ronald Marhefka, Antenna and Wave Propagation, McGraw Hill
- Warren Stutzman and Gary Thiele, Antenna Theory and Design, Wiley
- R.L.Yadava Antenna and Wave Propagation, PHI Learning.
- Edward Jordan and Keith Balmain, Electromagnetic Waves and Radiating Systems, Pearson

Semester V

CEL 505 (i)
Skill Enhancement Course II(Electronics)
Design and Fabrication of Printed Circuit Boards
(Credits: 02; 30 Hrs (2Hrs /week))

Marks for Major Test (External): 50

Marks for Internal Exam: 50

Time: 2 Hours

Paper setter is required to set 5 questions in all. Question no. 1 is Compulsory and is based on the entire syllabus consisting of ten short answer type questions each of 2 marks. The remaining four questions is to be set uniformly having two questions from each unit. The student is required to attempt three questions in all selecting one question from each unit and Question no. 1 is Compulsory.

UNIT-I

(15 Hours)

PCB Fundamentals:

PCB Advantages, components of PCB, Electronic components, Microprocessors and Microcontrollers, IC's, Surface Mount Devices (SMD), Data sheets, Classification of PCB- single, double, multilayer and flexible boards, Manufacturing of PCB, PCB standards.

Schematic and Layout Design:

Schematic diagram, General, Mechanical and Electrical design considerations, Placing and Mounting of components, Conductor spacing, routing guidelines, heat sinks and package density, Net list, creating components for library, Tracks, Pads, Vias, power plane, grounding.

UNIT-II

(15 Hours)

Technology OF PCB:

Design automation, Design Rule Checking, Exporting Drill and Gerber Files, Drills, Footprints and Libraries, Adding and Editing Pins, copper clad laminates, materials of copper clad laminates, properties of laminates (electrical and physical), types of laminates, Film master preparation, Image transfer, photo printing, Screen Printing.

Plating techniques etching techniques, Mechanical Machining operations, Lead cutting and Soldering Techniques, Testing and quality controls.

Reference Books:

- R.S Khandpur, Printed Circuit Board: Design, Fabrication, Assembly and Testing, Tata McGraw Hill.
- Walter Bosshart, Printed Circuit Boards: Design and Technology, Tata McGraw Hill.

CEL 505 (ii)
Skill Enhancement Course II(Electronics)
Robotics
(Credits: 02; 30 Hrs (2Hrs /week))

Marks for Major Test (External): 50

Marks for Internal Exam: 50

Time: 2 Hours

Paper setter is required to set 5 questions in all. Question no. 1 is Compulsory and is based on the entire syllabus consisting of ten short answer type questions each of 2 marks. The remaining four questions is to be set uniformly having two questions from each unit. The student is required to attempt three questions in all selecting one question from each unit and Question no. 1 is Compulsory.

UNIT-I

(15 Hours)

Robot defining Criteria , basic components of a robot - sensor, actuator, controller, end effector
Arduino control Board for robots, installing arduino software on windows, interfacing arduino with computer, installing arduino IDE on android devices.

Sensors:

Analog and digital sensors, active and passive sensors, attributes of sensors, sensor calibration
Ultrasonic sensor (modes, accuracy, limitations, calibration), light sensor, Position encoders, Gyroscope and Accelerometer, Temperature and humidity sensor (DHT 11)

UNIT-II

(15 Hours)

Actuators:

Motor characteristics (voltage, current, speed, torque, resistance), DC Motors, speed and torque, Gearing and Efficiency, Servo Motors, Stepper motors, Motor Control and its implementations.

Interfacing and other operations of robotics:

programming Arduino for DC motor control, programming Arduino for servo motor, sensor interfacing to arduino.

Reference Books:

- Cameron Hughes, Tracy Hughes, Robot Programming : A guide to controlling autonomous robots, Pearson
 - Vinesh Kumar, Make your first robot, Notion press.
 - K S Fu, R C Gonzalez, Robotics : control, sensing, vision and intelligence, McGraw Hill
 - Ashitava Ghosal, Robotics : fundamental concepts and analysis, Oxford
 - Richard Blum, Arduino Programming, Pearson
-

CEL 505 (iii)
Skill Enhancement Course II(Electronics)
Mobile Application Programming
(Credits: 02; 30 Hrs (2Hrs /week))

Marks for Major Test (External): 50

Marks for Internal Exam: 50

Time: 2 Hours

Paper setter is required to set 5 questions in all. Question no. 1 is Compulsory and is based on the entire syllabus consisting of ten short answer type questions each of 2 marks. The remaining four questions is to be set uniformly having two questions from each unit. The student is required to attempt three questions in all selecting one question from each unit and Question no. 1 is Compulsory.

UNIT-I

(15 Hours)

Introduction to Mobile Application Programming :

What is mobile Application Programming, Different Platforms, Architecture and working of Android, iOS and Windows phone 8 operating system, Comparison of Android, iOS and Windows phone 8 functions

Android Development Environment:

What is Android, Advantages and Future of Android, Tools and about Android SDK, Installing Java, Eclipse, and Android, Android Software Development Kit for Eclipse, Android Development Tool: Android Tools for Eclipse, AVDs: Smartphone Emulators, Image Editing

UNIT-II

(15 Hours)

Android Software Development Platform:

Understanding Java SE and the Dalvik Virtual Machine, Directory Structure of an Android Project, Common Default Resources Folders, The Values Folder, Leveraging Android XML, Screen Sizes, Launching Your Application: The Android Manifest.xml File, Creating Your First Android Application

Android Framework Overview:

The Foundation of OOP, The APK File, Android Application Components, Android Activities: Defining the User Interface, Android Services: Processing in the Background, Broadcast Receivers: Announcements and Notifications, Content Providers: Data Management, Android Intent Objects: Messaging for Components, Android Manifest XML: Declaring Your Components.

Reference Books:

- Barry Burd, Android Application Development, John Wiley & sons
 - Joseph Annuzzi, Lauren Darcy, Introduction to Android Application Development, Addison Wesley
 - Mathew Gimson, Android Programming
-

CEP 509 (i)
Practical -V (Electronics)
Electronic Instrumentation Lab
(Credits: 02; 60 Hrs (4Hrs /week))

Marks: 100

Time: 4 Hours

At least 8 experiments are to be performed including at least 6 experiments from following:

1. To analyze analog and digital multi meter for various measurements.
2. To study the front panel controls of storage CRO.
3. To measure resistance by Wheatstone bridge and measurement of bridge sensitivity.
4. To measure Capacitance by De Sauty's bridge
5. To determine the Characteristics of resistance transducer - Strain Gauge (Measurement of Strain using half and full bridge.)
6. To determine the Characteristics of LVDT.
7. To determine the Characteristics of Thermistors and RTD.
8. To measure temperature using Thermocouples.
9. To design regulated power supply of given rating (5 V or 9V).
10. To design and study the Sample and Hold Circuit.
11. To plot the frequency response of a microphone.
12. To measure pressure using Piezo-Electric Pick up.
13. To measure distance using LDR.
14. To study Arduino microcontroller.
15. To study RS 232 interface.

CEP 509 (ii)
Practical -V (Electronics)
Signal and System Lab
(Credits: 02; 60 Hrs (4Hrs /week))

Marks:100
Time: 4 Hours

At least 08 experiments are to be performed including at least 06 experiments from following using numerical computation software SciLab/MatLab

1. To generate continuous and discrete unit step signal.
2. To generate ramp and exponential signal in continuous and discrete domain.
3. To perform addition and subtraction of two signal in continuous and discrete domain.
4. To find and plot even and odd components of a signal.
5. To perform time shifting and time scaling operation on signals.
6. To perform folding and multiplication operation on signals.
7. To generate a random binary signal.
8. To determine and analyze energy of a continuous and discrete signal.
9. To determine and analyze power spectrum of a signal.
10. To determine autocorrelation and cross correlation of discrete data sequences.
11. To obtain and plot convolution of a discrete signal.
12. To obtain pole-zero plot of a given transfer function.
13. To determine and plot Fourier series representation of a given function.
14. To determine and plot Fourier transform of a discrete signal.
15. To write a program for time invariant system.
16. To write a program for linear system.

CEP 509 (iii)
Practical -V (Electronics)
Electronics Skill Lab
(Credits: 02; 60 Hrs (4Hrs /week))

Marks: 100

Time: 4 Hours

At least 08 experiments are to be performed including at least 06 experiments from following:

1. To familiarize about electronic components and their values
2. To study data sheets of diode and transistor.
3. Introduction of circuit schematic and layout tool.
4. To design schematic and layout of full wave rectifier.
5. To design schematic and layout of regulated DC power supply.
6. To design schematic and layout of clipper circuit.
7. Introduction of Design rule check (DRC) and Netlist.
8. Introduction of PCB types and standards.
9. Introduction of image transfer techniques.
10. Introduction of etching techniques.
11. Introduction of Soldering tools, materials and process.
12. To build and test full wave rectifier circuit on PCB.
13. To build and test power supply circuit on PCB.
14. To build and test clipper circuit on PCB.

Semester VI
CEL 603 (i)
Discipline Specific Course III (Electronics)
Digital System Design
(Credits: 02; 30 Hrs (2Hrs /week))

Marks for Major Test (External): 80

Marks for Internal Exam: 20

Time: 3 Hours

Paper setter is required to set nine questions in all. Question no. 1 is Compulsory and is based on the entire syllabus consisting of eight to ten short answer type questions each of 2 marks. The remaining eight questions is to be set uniformly having two questions from each unit. The student is required to attempt five questions in all selecting one question from each unit and Question no. 1 is Compulsory wherein student is required to attempt 8 parts.

UNIT-I

(7 Hours)

Introduction to digital design and VERILOG:

Digital logic design flow, Benefits of CAD, Introduction to HDLs, Verilog and its capabilities, Design Methodologies, Modules, Instances, Components of Simulation and Test Bench. Basic Concepts: Data Types, System Tasks and Compiler Directives. Modules and Ports.

UNIT-II

(7 Hours)

Combinational circuit design using Verilog:

multiplexers, demultiplexers, decoders, encoders and adder circuits.

UNIT-III

(8 Hours)

Sequential circuit design using Verilog:

flip-flop, latch and register. Finite state machines: Mealy and Moore. shift registers and counters.

UNIT-IV

(8 Hours)

Programmable logic devices:

Evolution of Programmable logic devices. PAL, PLA, FPGA architectures. Placement and routing. Logic cell structure, Programmable interconnects, Logic blocks and I/O Ports. Clock distribution in FPGA. Timing issues in FPGA design. Boundary scan

Reference Books:

- Samir Palnitkar, Verilog HDL, Pearson Education; Second edition (2003).
- Zainalabedin Navabi, Verilog Digital System Design. TMH; 2nd edition.
- J. Bhaskar, A Verilog HDL Primer, Pearson
- D.J. Laja and S. Sapatnekar, Designing Digital Computer Systems with Verilog, Cambridge University Press, 2015.
- VLSI design, Debaprasad Das, 2nd Edition, 2015, Oxford University Press.
- Lizy Kurien and Charles Roth, Principles of Digital Systems Design and VHDL. Cengage Publishing.
- Ming-Bo Lin, Digital System Designs and Practices: Using Verilog HDL and FPGAs. Wiley India Pvt Ltd.
- Wayne Wolf, FPGA Based System Design. Pearson Education.

CEL 603 (ii)
Discipline Specific Course III (Electronics);
Digital Signal Processing
(Credits: 02; 30 Hrs (2Hrs /week))

Marks for Major Test (External): 80

Marks for Internal Exam: 20

Time: 3 Hours

Paper setter is required to set nine questions in all. Question no. 1 is Compulsory and is based on the entire syllabus consisting of eight to ten short answer type questions each of 2 marks. The remaining eight questions is to be set uniformly having two questions from each unit. The student is required to attempt five questions in all selecting one question from each unit and Question no. 1 is Compulsory wherein student is required to attempt 8 parts.

UNIT-I

(8 Hours)

Discrete-Time Fourier Transform:

Fourier Transform representation for Discrete –Time Aperiodic & Periodic Signals, Properties of Discrete –Time Fourier Transform, Basic Fourier Transform Pairs.

UNIT-II

(7 Hours)

Z-Transform

Introduction to Z-Transform, Region of Convergence (ROC) for Z-Transform, Z-Transform Properties, Inverse Z-Transform, Analysis of LTI Systems Using Z-Transform, Application of z transform,

UNIT-III

(7 Hours)

Discrete Fourier Transform:

Frequency Domain Sampling (Sampling of DTFT), The Discrete Fourier Transform (DFT) and its Inverse, DFT Properties: Periodicity, Linearity, Circular Time Shifting, Circular Frequency Shifting; Linear Convolution Using the DFT

Filter Concepts:

Phase Delay and Group delay, Zero-Phase Filter, Linear-Phase Filter, Advantages and Disadvantages of Digital Filters, Simple FIR Digital Filters, Simple IIR Digital Filters

UNIT-IV

(8 Hours)

Finite Impulse Response Digital Filter:

Desirability of Linear-Phase Filters, Frequency Response of Linear-Phase FIR Filters Rectangular Windowing Method

Infinite Impulse Response Digital Filter:

Design of IIR Filters from Analog Filters, IIR Filter Design by Impulse Invariance Method.

Reference Books:

- Digital Signal Processing, Tarun Kumar Rawat, 2015, Oxford University Press, India.
- Digital Signal Processing, S. K. Mitra, McGraw Hill, India.
- Principles of Signal Processing and Linear Systems, B.P. Lathi, 2009, 1st Edition, Oxford University Press.
- Fundamentals of Digital Signal processing using MATLAB, R.J. Schilling and S.L. Harris, 2005, Cengage Learning.
- Fundamentals of signals and systems, P.D. Cha and J.I. Molinder, 2007, Cambridge University Press.

- Digital Signal Processing Principles Algorithm & Applications, J.G. Proakis and D.G. Manolakis, 2007, 4th Edition, Prentice Hall.
- K.A. Navas and R Jayadevan, Lab Primer Through MATLAB, PHI

CEL 603 (iii)
Discipline Specific Course III (Electronics);
Photonic Devices
(Credits: 02; 30 Hrs (2Hrs /week))

Marks for Major Test (External): 80

Marks for Internal Exam: 20

Time: 3 Hours

Paper setter is required to set nine questions in all. Question no. 1 is Compulsory and is based on the entire syllabus consisting of eight to ten short answer type questions each of 2 marks. The remaining eight questions is to be set uniformly having two questions from each unit. The student is required to attempt five questions in all selecting one question from each unit and Question no. 1 is Compulsory wherein student is required to attempt 8 parts.

UNIT-I **(8 Hours)**

Classification of photonic devices. Interaction of radiation and matter, Radiative transition and optical absorption.

Light Emitting Diodes- Construction, materials and operation. Semiconductor Laser- Condition for amplification, laser cavity, heterostructure and quantum well devices. Charge carrier and photon confinement, line shape function. Threshold current. Laser diode.

UNIT-II **(7 Hours)**

Photodetectors: Photoconductor. Photodiodes (p-i-n, avalanche) and Photo transistors, quantum efficiency and responsivity. Photomultiplier tube.

UNIT-III **(7 Hours)**

Solar Cell: Construction, working and characteristics

LCD Displays: Types of liquid crystals, Principle of Liquid Crystal Displays, applications, advantages over LED displays.

UNIT-IV **(8 Hours)**

Introduction to Fiber Optics: Evolution of fiber optic system- Element of an Optical Fiber Transmission link- Ray Optics-Optical Fiber Modes and Configurations -Mode theory of Circular Wave guides- Overview of Modes-Key Modal concepts- Linearly Polarized Modes - Single Mode Fibers-Graded Index fiber structure.

Reference Books:

- Gerd Keiser, Optical communications essentials, McGraw Hill.
- Djafar K. Mynbaev, Fiber-Optic communications technology, Pearson.
- John M Senior, Optical Fiber Communications, PHI.
- J. Wilson & J.F.B. Hawkes, Optoelectronics: An Introduction, Prentice Hall India (1996).
- S.O. Kasap, Optoelectronics & Photonics, Pearson Education (2009).
- AK Ghatak & K Thyagarajan, Introduction to fiber optics, Cambridge Univ. Press (1998).
- Optoelectronic Devices and Systems, Gupta, 2nd edition, PHI learning.

CEL 604 (i)
Discipline Specific Course IV (Electronics);
VLSI Design
(Credits: 02; 30 Hrs (2Hrs /week))

Marks for Major Test (External): 80

Marks for Internal Exam: 20

Time: 3 Hours

Paper setter is required to set nine questions in all. Question no. 1 is Compulsory and is based on the entire syllabus consisting of eight to ten short answer type questions each of 2 marks. The remaining eight questions is to be set uniformly having two questions from each unit. The student is required to attempt five questions in all selecting one question from each unit and Question no. 1 is Compulsory wherein student is required to attempt 8 parts.

UNIT-I

(8 Hours)

CMOS Logic:

Inverter, NAND gate, combinational logic, NOR gate, compound gates, pass transistors and transmission gates, Tristates, Multiplexers, latches and flip flops. VLSI Design flow

UNIT-II

(7 Hours)

MOS Transistor Theory:

Introduction, I-V characteristics, C-V characteristics, Non Ideal I-V effects - Velocity saturation, Channel length modulation, Body Effect, Subthreshold conduction. Noise Margin.

UNIT-III

(7 Hours)

Circuit characterization and Performance Estimation:

Delay Estimation, RC Delay Models, Delay in multistage logic networks, choosing the best number of stages, static and dynamic power dissipation, Low power design, Interconnect, Design Margin

UNIT-IV

(8 Hours)

Circuit Design:

Combinational Circuit Design: Static CMOS, Ratioed Circuits

Sequential Circuit Design: Sequencing static circuits, Conventional CMOS latches and flip-flops.

Reference Books:

- Neil H.E. Weste, David Harris, CMOS VLSI Design : A circuits and systems perspective, Pearson
- Jan M Rabaey, Anantha Chandrakasan & Nikolic, Introduction to Digital Integrated Circuits: A design perspective, Pearson

CEL 604 (ii)
Discipline Specific Course IV (Electronics)
Internet of Things
(Credits: 02; 30 Hrs (2Hrs /week))

Marks for Major Test (External): 80

Marks for Internal Exam: 20

Time: 3 Hours

Paper setter is required to set nine questions in all. Question no. 1 is Compulsory and is based on the entire syllabus consisting of eight to ten short answer type questions each of 2 marks. The remaining eight questions is to be set uniformly having two questions from each unit. The student is required to attempt five questions in all selecting one question from each unit and Question no. 1 is Compulsory wherein student is required to attempt 8 parts.

UNIT-I

(8 Hours)

Introduction:

Definition and characteristics of IOT, Physical Design of IoT, Logical Design of IoT, Basic steps of IoT Design methodology, IoT enabling technologies, M2M basics, Difference between IoT and M2M. Software defined networking. network function virtualization.

UNIT-II

(7 Hours)

IoT Physical Devices:

Basic building blocks of an IoT device, Exemplary Devices - Raspberry Pi, Arduino, Arduino board details, Analog, digital and PWM pins, Arduino IDE software, SPI and I2C communications,

UNIT-III

(7 Hours)

Interfacing:

Interfacing LED, LCD with Arduino, Programs to interface sensors to Arduino, Interfacing motors.

UNIT-IV

(8 Hours)

Case Studies:

Smart lighting, Home intrusion detection, smart parking system, Air pollution monitoring, Smart irrigation

Reference Books:

- Arshdeep Bahga, Vijay Madisetti, Internet of Things: A Hands-on approach, Universities press
- K.G.Srinivasa, G.M.Siddesh, Internet of Things, Cengage
- Adrian Mcewen, Hakin Cassimally, Designing the internet of Things, Wiley
- David Hanes, Gonzalo Salagueiro, IoT Fundamentals, CISCO

CEL 604 (iii)
Discipline Specific Course IV (Electronics);
Consumer Electronics
(Credits: 02; 30 Hrs (2Hrs /week))

Marks for Major Test (External): 80

Marks for Internal Exam: 20

Time: 3 Hours

Paper setter is required to set nine questions in all. Question no. 1 is Compulsory and is based on the entire syllabus consisting of eight to ten short answer type questions each of 2 marks. The remaining eight questions is to be set uniformly having two questions from each unit. The student is required to attempt five questions in all selecting one question from each unit and Question no. 1 is Compulsory wherein student is required to attempt 8 parts.

UNIT-I

(8 Hours)

Audio and Video Systems

Microphones: Construction, working principles and applications of microphones, their types viz: a) Carbon b) moving coil, c) velocity, d) crystal, e) condenser, e) cordless etc; Loud Speaker: Direct radiating, horn loaded woofer, tweeter, mid range, multi-speaker system, baffles and enclosures; Sound recording on magnetic tape, its principles, block diagram and tape transport mechanism; Digital sound recording on tape and disc CD system: Hi-Fi system, pre-amplifier, amplifier and equalizer system, stereo amplifiers

UNIT-II

(7 Hours)

Video Systems:

Different types of screens: LCD, LED, Plasma, CRT, 3d display, Digital cameras (still and video), Basic idea of principles of Black and White and colour TV and their difference, Standards Remote Control, VCD and DVD Players

UNIT-III

(7 Hours)

Office and Home Gadgets

Basic block diagram, working of the followings: Desktop computer, Laptop, Micro SD card, Pen drive, Hard disk, Printer (inkjet and laser), Scanner, FAX machine, Photostat and Xerox machines, EPABX, Micro wave ovens, washing machine, RO, UPS/inverters, Air conditioners, Refrigerators

UNIT-IV

(8 Hours)

Advance Gadgets:

Basic block diagram and working of the followings: Drones, Bar coding, Automated Teller Machines (ATM), Dish washer, cable TV and DTH, cable TV using internet, Electronic Ignition Systems for automobiles, Home security and CCTV, 3D Printers, LCD projector

Reference Books:

- S.P Bali, Consumer Electronics, Pearson Education
- Philip Hoff, Consumer Electronics for Engineers, Cambridge University Press
- B.Grob, Basic Electronics, Tata Mc Graw Hill
- Thomas E. Kissell, Industrial Electronics: Applications for Programmable Controllers, Instrumentation and Process Control, and Electrical Machines and Motor Controls, Prentice Hall

CEP 609 (i)
Practical -VI (Electronics)
Digital System Design Lab
(Credits: 02; 60 Hrs (4Hrs /week))

Marks: 100

Time: 4 Hours

At least 08 experiments are to be performed including at least 06 experiments from following using Verilog:

1. Write code to realize basic and derived logic gates.
2. To design Half adder, Full Adder using basic and derived gates.
3. To design Half subtractor and Full Subtractor using basic and derived gates.
4. Design and simulation of a 4 bit Adder.
5. Multiplexer (4x1) using logic gates.
6. To design Demultiplexer using logic gates.
7. To design Encoder using logic gates.
8. To design Decoder using logic gates.
9. Design and simulation of Comparator.
10. Design and simulation of Clocked D, JK and T Flip flops (with Reset inputs)
11. Design and simulation 3-bit Ripple counter
12. Design and simulation of ALU
13. To design and study switching circuits (LED blink shift)
14. To design traffic light controller.
15. To interface a keyboard.
16. To interface multiplexed seven segment display.
17. To interface a LCD using FPGA
18. To interface a stepper motor and DC motor.
19. To interface ADC 0804.

CEP 609 (ii)

Practical -VI (Electronics)

Digital Signal Processing Lab

(Credits: 02; 60 Hrs (4Hrs /week))

Marks: 100

Time: 4 Hours

At least 08 experiments are to be performed including at least 06 experiments from following using numerical computation software SciLab/MatLab

1. Write a program to generate and plot the following sequences: (a) Unit sample sequence $\delta(n)$, (b) unit step sequence $u(n)$, (c) ramp sequence $r(n)$, (d) real valued exponential sequence $x(n) = (0.8)^n u(n)$ for $0 \leq n \leq 50$.

2. Write a program to compute the convolution sum of a rectangle signal (or gate function) with itself for $N = 5$

$$x(n) = \text{rect}\left(\frac{n}{2N}\right) = \Pi\left(\frac{n}{2N}\right) = \begin{cases} 1 & -N \leq n \leq N \\ 0 & \text{otherwise} \end{cases}$$

3. An LTI system is specified by the difference equation

$$y(n) = 0.8y(n-1) + x(n)$$

(a) Determine $H(e^{j\omega})$

(b) Calculate and plot the steady state response $y_{ss}(n)$ to

$$x(n) = \cos(0.5\pi n)u(n)$$

4. Given a casual system

$$y(n) = 0.9y(n-1) + x(n)$$

(a) Find $H(z)$ and sketch its pole-zero plot

(b) Plot the frequency response $|H(e^{j\omega})|$ and $\angle H(e^{j\omega})$

5. Design a digital filter to eliminate the lower frequency sinusoid of $x(t) = \sin 7t + \sin 200t$. The sampling frequency is $f_s = 500 \text{ Hz}$. Plot its pole zero diagram, magnitude response, input and output of the filter.

6. Let $x(n)$ be a 4-point sequence:

$$x(n) = \underset{\uparrow}{\{1,1,1,1\}} = \begin{cases} 1 & 0 \leq n \leq 3 \\ 0 & \text{otherwise} \end{cases}$$

Compute the DTFT $X(e^{jw})$ and plot its magnitude

- (a) Compute and plot the 4 point DFT of $x(n)$
 (b) Compute and plot the 8 point DFT of $x(n)$ (by appending 4 zeros)
 (c) Compute and plot the 16 point DFT of $x(n)$ (by appending 12 zeros)
7. Let $x(n)$ and $h(n)$ be the two 4-point sequences,

$$x(n) = \underset{\uparrow}{\{1,2,2,1\}}$$

$$h(n) = \underset{\uparrow}{\{1,-1,-1,1\}}$$

Write a program to compute their linear convolution using circular convolution.

8. Using a rectangular window, design a FIR low-pass filter with a pass-band gain of unity, cut off frequency of 1000 Hz and working at a sampling frequency of 5 KHz. Take the length of the impulse response as 17.
9. Design an FIR filter to meet the following specifications:
 passband edge $F_p = 2 \text{ KHz}$
 stopband edge $F_s = 5 \text{ KHz}$
 Passband attenuation $A_p = 2 \text{ dB}$
 Stopband attenuation $A_s = 42 \text{ dB}$
 Sampling frequency $F_s = 20 \text{ KHz}$
10. The frequency response of a linear phase digital differentiator is given by

$$H_d(e^{jw}) = jw e^{-j\tau w} \quad |w| \leq \pi$$

Using a Hamming window of length $M = 21$, design a digital FIR differentiator. Plot the amplitude response.

CEP 609 (iii)
Practical -VI (Electronics)
Advance Communication Lab
(Credits: 02; 60 Hrs (4Hrs /week))

Marks: 100

Time: 4 Hours

At least 08 experiments are to be performed including at least 06 experiments from following:

1. To study FSK modulator.
2. To study PSK modulator.
3. To study ASK modulator.
4. To study Time Division Multiplexing of two band limited signals.
5. To study Frequency Division Multiplexing of two band limited signals.
6. To study various line coding techniques
7. To study Pre-emphasis and de-emphasis
8. To study DPSK generation and detection
9. To study QPSK generation and detection
10. To measure Numerical Aperture of a given optical fiber
11. To study Analog and Digital communication link using optical fiber.
12. To study BER in optical transmitter fiber link.
13. To measure losses in a given optical fiber (propagation loss, bending loss)
14. To measure directivity and gain of Standard dipole antenna.
15. To measure directivity and gain of microstrip patch antenna
16. To measure directivity and gain of Yagi antenna

SEMESTER V & VI
B. SC. PHYSICAL SCIENCES
(MATHEMATICS)

CML-506 (i): Groups and Rings

Marks (Theory): 80

Marks (Internal Assessment) : 20

Marks (Total) : 100

Time : 3 Hrs

Note: Attempt five questions in all. The question paper will consist of **four** sections. **Question No. 1** will contain **seven** short answer type questions without any internal choice covering the entire syllabus and shall be **compulsory**. Each of the four sections **(I-IV)** will contain two questions and the students are required to attempt **one** question from each section. **All questions carry equal marks.**

Section – I

Definition of a group. Examples of abelian and nonabelian groups. The group Z_n of integers under addition modulo n and the group of $U(n)$ of units under multiplication modulo n . Generator of a group. Cyclic groups. Permutations groups. Alternating groups, Cayley's theorem. Subgroups and Subgroup criteria. Cosets, Left and right cosets, properties of cosets.

Section – II

Index of a sub-group. Coset decomposition, Lagrange's theorem on groups and its consequences, Normal subgroups, Quotient groups, Homomorphisms, isomorphisms, automorphisms on group. Center of a group and class equation of a group and derived group of a group.

Section – III

Introduction to Rings, Subrings, Integral domains and Fields, Characteristics of a ring. Ring homomorphisms, Theorems on Ring homomorphisms. Ideals (Principal, Prime and Maximal) and Quotient rings, Field of quotients of an integral domain.

Section – IV

Euclidean rings, Polynomial rings, Polynomials over the rational field, The Eisenstein's criterion of irreducibility of polynomials over the field of rational numbers. Polynomial rings over commutative rings. Principal ideal domain, Unique factorization domain.

Books Recommended:

1. I.N. Herstein, Topics in Algebra, Wiley Eastern Ltd., New Delhi, 1975
2. P.B. Bhattacharya, S.K. Jain and S.R. Nagpal, Basic Abstract Algebra (2nd edition).
3. VivekSahai and VikasBist, Algebra, Narosa Publishing House.
4. I.S. Luther and I.B.S. Passi, Algebra, Vol.-II, Narosa Publishing House.

CML-506(ii): Sampling Techniques

Marks (Theory): 80

Marks (Internal Assessment) : 20

Marks(Total) : 100

Time : 3 Hrs

Note: Attempt five questions in all. The question paper will consist of **four** sections. **Question No. 1** will contain **seven** short answer type questions without any internal choice covering the entire syllabus and shall be **compulsory**. Each of the four sections **(I-IV)** will contain two questions and the students are required to attempt **one** question from each section. **All questions carry equal marks.**

Section-I

Sample Surveys: Concepts of population, sample, sampling unit, parameter, statistic, sample frame and standard error. Principal steps in sample surveys - need for sampling, census versus sample surveys, sampling and non- sampling errors, sources and treatment of non-sampling errors, advantages and limitations of sampling. Sampling Methods: Types of sampling: Subjective, probability and mixed sampling methods. Methods of drawing random samples with and without replacement.

Section-II

Estimates of population mean, total, and proportion, their variances and the estimates of variances in Simple Random Sampling With and Without Replacement. Estimates of population mean, total, and proportion, their variances and the estimates of variances with (i) Stratified Random Sampling with Proportional and Neyman allocation, and (ii) Systematic Sampling when $N = nk$. Comparison of relative efficiencies. Advantages and disadvantages of SRS, Stratified and Systematic sampling methods.

Section-III

Time series: Time series and its components with illustrations, additive, multiplicative and mixed models. Determination of trend by least squares and moving average methods. Growth curves and their fitting with reference to Modified exponential, Gompertz and Logistic curves. Determination of seasonal indices by Ratio to moving average, ratio to trend and link relative methods.

Section-IV

Demand Analysis: Introduction. Demand and supply, price elasticity of supply and demand. Methods of determining demand and supply curves, Leontief's, Pigou's methods of determining demand curve from time series data, limitations of these methods Pigou's method from time series data. Pareto law of income distribution curves of concentration. Index Numbers: Concept, construction, uses and limitations of simple and weighted index numbers. Laspeyer's, Paasche's and Fisher's index numbers, criterion of a good index numbers.

Recommended Books:

1. A.M.Goon, M.K.Gupta, B. Dasgupta: Fundamentals of Statistics Vol II World Press Private Ltd., Calcutta
2. A.M.Goon, M.K.Gupta, B. Dasgupta An outline of Statistical Theory Vol II World Press Private Ltd., Calcutta.
3. Cochran W.G., Sampling Techniques, Wiley Publishers
4. Daroga Singh and Chowdhary: Theory and Analysis of Sample survey designs. Wiley Eastern.
5. S.P.Gupta : Statistical Methods. Sultan Chand and Sons.
6. Sukhatmeet. al., Sample Theory of Surveys with Applications, Iowa State Uni. Press & IARS
7. V.K. Kapoor and S.C. Gupta: Fundamentals of Applied Statistics. Sultan Chand.

CML-507 (i): Sequence and Series

Marks (Theory): 80

Marks: Internal Assessment (20)

Marks (Total): 100

Time: 3 Hours

Note: Attempt five questions in all. The question paper will consist of four sections. **Question No. 1** will contain **seven** short answer type questions without any internal choice covering the entire syllabus and shall be compulsory. Each of the four sections (**I-IV**) will contain two questions and the students are required to attempt one question from each section. All questions carry equal marks.

SECTION-I

Boundedness of the set of real numbers; least upper bound, greatest lower bound of a set, neighborhoods, interior points, isolated points, limit points, open sets, closed set, interior of a set, closure of a set in real numbers and their properties.

Sequence: Real sequences and their convergence, theorem on limits of sequence, bounded and monotonic sequences, Cauchy's sequence, Cauchy general principle of convergence, subsequences, subsequential limits.

SECTION-II

Infinite series: Convergence and divergence of Infinite Series, Comparison Tests of positive terms Infinite series, Cauchy's general principle of Convergence of series, Convergence and divergence of geometric series, Hyper Harmonic series or p-series. D-Alembert's ratio test, Raabe's test, Logarithmic test, De Morgan and Bertrand's test, Cauchy's nth root test, Gauss Test, Cauchy's integral test, Cauchy's condensation test.

Alternating series: Leibnitz's test, absolute and conditional convergence. Arbitrary series: Abel's lemma, Abel's test, Dirichlet's test.

SECTION-III

Fourier's series: Fourier expansion of piecewise monotonic functions, Properties of Fourier Coefficients, Dirichlet's conditions, Parseval's identity for Fourier series, Fourier series for even and odd functions, Half range series, Change of Intervals.

SECTION-IV

Riemann integral: Definition and examples. Darboux's Theorem and condition of existence of Riemann's integral. Integrability of continuous, monotonic functions and discontinuous functions. Properties of integrable functions. Continuity and differentiability of integrable functions. Primitive. The Fundamental theorem of integral calculus. Mean value theorems of integral calculus.

Books Recommended

1. T.M.Apostol, Mathematical Analysis, Narosa Publishing House, New Delhi, 1985.
2. R.R. Goldberg, Methods of Real Analysis, John Wiley and Sons, Inc., New York, 1976.
3. SC Malik and Savita Arora, Mathematical New Age International (P) Limited Published, New Delhi, 2012 (Fourth Edition).
4. D. Somasundaram and B. Choudhary: A First Course in Mathematical Analysis, Narosa Publishing House, New Delhi, 1997.
5. R.G. Bartle and D.R. Shernert: Introduction to Real Analysis, Wiley, 2011.
6. Shanti Narayan : A Course of Mathematical Analysis, S. Chand & Co., New Delhi

CML-507(ii): Sample Surveys and Design of Experiments

Marks (Theory): 80

Marks (Total): 100

Marks (Internal Assessment): 20

Time : 3 Hrs

Note: Attempt five questions in all. The question paper will consist of four sections. **Question No. 1** will contain **seven** short answer type questions without any internal choice covering the entire syllabus and shall be compulsory. Each of the four sections **(I-IV)** will contain two questions and the students are required to attempt one question from each section. **All questions carry equal marks.**

Section-I

Sample Surveys: Concepts of population and sample. Complete enumeration vs. sampling. Need for sampling. Principal and organizational aspects in the conduct of a sample survey. Properties of a good estimator, Sampling and non-sampling errors.

Section-II

SRSWR & SRSWOR, determination of sample size. Stratified random sampling and different allocations. Systematic sampling, comparison of known sampling strategies under linear trend. Ratio and Regression estimators and their comparison with SRSWOR estimator.

Section-III

Indian official Statistics: Present official Statistical system in India relating to census of population, agriculture, industrial production, and prices; methods of collection of official Statistics, Their reliability and limitation and the principal publications containing such Statistics. Also the various agencies responsible for the data collection- C.S.O., N.S.S.o., office of the Registrar General, Their historical development, main functions and important publications.

Analysis of variance and covariance: analysis of variance and covariance (with one concomitant variable) in one way and two way classified data with equal number of observations per cell.

Section-IV

Design of experiments: Principles of experimentation, uniformity trials, completely randomized, Randomized block and Latin square designs. Missing plot technique, 2^2 and 2^3 Factorial experiments: construction and analysis.

Regression Analysis: Two variable linear model- estimation, testing and problems of predication. Predication of the estimated regression equation, interval estimation, variance estimation.

Books Recommended

1. W.G. Cochran, *Sampling Techniques*, John Wiley and Sons, New York, 1997.
2. A.M. Goon, M. K. Gupta and B. Dasgupta, *fundamentals of Statistics* (Vol.II), 8th Ed. World Press, Kolkata, 2005.
3. A.M. Goon, M. K. Gupta and B. Dasgupta, *An Outline of Statistical Theory* (Vol. II), 3rd Ed. World Press, Kolkata, 2005.
4. S.C. Gupta and V.K. Kapoor, *Fundamentals of Applied Statistics*, 4th Ed., Sultan Chand and Sons, 2008.
5. A. M. Kshirsagar, *A Course in Linear Models*, Marcel Dekker, Inc., N.Y., 1983.

CML-508(i): Number Theory & Trigonometry

Marks (Theory): 80

Marks (Internal Assessment) : 20

Marks(Total) : 100

Time : 3 Hrs

Note: Attempt five questions in all. The question paper will consist of **four** sections. **Question No. 1** will contain **seven** short answer type questions without any internal choice covering the entire syllabus and shall be **compulsory**. Each of the four sections **(I-IV)** will contain two questions and the students are required to attempt **one** question from each section. **All questions carry equal marks.**

Section-I

Linear Diophantine equation, prime counting function, statement of prime number theorem, Goldbach conjecture, linear congruences, complete set of residues, Chinese remainder theorem, Fermat's little theorem, Wilson's theorem.

Section-II

Number theoretic functions, sum and number of divisors, totally multiplicative functions, the Möbius inversion formula, the greatest integer function, Euler's phi-function, Euler's theorem, reduced set of residues, some properties of Euler's phi-function.

Section-III

Order of an integer modulo n , primitive roots for primes, composite numbers having primitive roots, Euler's criterion, the Legendre symbol and its properties, quadratic reciprocity, quadratic congruences with composite moduli.

Section-IV

Exponential, Logarithmic, Circular functions; $\sin(nx)$, $\cos(nx)$, $\tan(nx)$, $\sin^n x$, $\cos^n x$, $\tan^n x$, hyperbolic and inverse hyperbolic functions - simple problems. Gregory's series, Summation of Trigonometric series, Trigonometric expansions of sine and cosine as infinite products (without proof).

Recommended Books:

1. David M. Burton, Elementary Number Theory (6th Edition), Tata McGraw-Hill Edition, Indian reprint, 2007.
2. Neville Robinns, Beginning Number Theory (2nd Edition), Narosa Publishing House Pvt. Limited, Delhi, 2007.
3. Trigonometry : P. Duraipandian
4. Plane Trigonometry part 2 : S. L. Loney, (Macmillan and Co. London)

CML-508(ii): Integer Programming and Theory of Games

Marks (Theory): 80

Marks (Internal Assessment) : 20

Marks(Total) : 100

Time : 3 Hrs

Note: Attempt five questions in all. The question paper will consist of **four** sections. **Question No. 1** will contain **seven** short answer type questions without any internal choice covering the entire syllabus and shall be **compulsory**. Each of the four sections **(I-IV)** will contain two questions and the students are required to attempt **one** question from each section. **All questions carry equal marks.**

Section-I

Scope and applicability. Formulations. Combinatorial optimization. Relaxations. Linear programs with integer solutions. Integer Programming Problem (IPP): Pure and Mixed IPP, Methods for solving IPP: Branch and Bound Method, implicit enumeration, Gomory's Cutting Plane Method.

Section-II

Applications of IPP, 0-1 Programming: applications, enumeration algorithm. Gomory-Chvátal theory. The mixed integer Gomory cut. The problem of convergence and stalling. Disjunctive programming: optimization over unions of polyhedra.

Section-III

Introduction to Game theory, Fundamental theorem of game theory, min-max and max-min principle, Formulation of two person zero sum rectangular games, Solution of rectangular games with saddle, points.

Section-IV

Dominance principle, rectangular games without saddle point- mixed strategy, games, Bayesian Games, Extensive Form Games with Perfect Information. Graphical, algebraic and linear programming solution of $m \times n$ games.

Recommended Books:

1. Hamdy A. Taha: Operations Research-An Introduction, Prentice Hall, 9th Edition, - 2010.
2. Frederick Hillier and Gerald Lieberman, Introduction to Operations Research. 9th Edition, McGraw-Hill Professional, 2010.
3. P. R. Thei, G. E. Keough: An introduction to Linear Programming and Game Theory. Wiley, New Jersey, 3rd Ed., 2008.
4. S. Chandra, Jayadeva, Aparna Mehra: Numerical Optimization with Application, Narosa Publishing House, 2009

CML-605 (i): Linear Algebra

Marks (Theory): 80

Marks (Internal Assessment) : 20

Marks(Total) : 100

Time : 3 Hrs

Note: Attempt five questions in all. The question paper will consist of **four** sections. **Question No. 1** will contain **seven** short answer type questions without any internal choice covering the entire syllabus and shall be **compulsory**. Each of the four sections **(I-IV)** will contain two questions and the students are required to attempt **one** question from each section. **All questions carry equal marks.**

Section – I

Vector spaces, subspaces, Sum and Direct sum of subspaces, Linear span, Linearly Independent and dependent subsets of a vector space. Finitely generated vector space, Existence theorem for basis of a finitely generated vector space, Finite dimensional vector spaces, Invariance of the number of elements of bases sets, Dimensions, Quotient space and its dimension.

Section – II

Homomorphism and isomorphism of vector spaces, Linear transformations and linear forms on vector spaces, Vector space of all the linear transformations, Null Space, Range space of a linear transformation, Rank and Nullity Theorem,

Section – III

Algebra of Linear Transformation, Minimal Polynomial of a linear transformation, Singular and non-singular linear transformations, Matrix of a linear Transformation, Change of basis, Eigen values and Eigen vectors of linear transformations.

Section – IV

Inner product spaces, Cauchy-Schwarz inequality, Orthogonal vectors, Orthogonal complements, Orthogonal sets and Basis, Bessel's inequality for finite dimensional vector spaces, Gram-Schmidt, Orthogonalization process, Adjoint of a linear transformation and its properties, Unitary linear transformations.

Books Recommended:

1. I.N. Herstein,: Topics in Algebra, Wiley Eastern Ltd., New Delhi, 1975
2. P.B. Bhattacharya, S.K. Jain and S.R. Nagpal, Basic Abstract Algebra (2nd edition).
3. VivekSahai and VikasBist, Algebra, Narosa Publishing House.
4. I.S. Luther and I.B.S. Passi, Algebra, Vol.-II, Narosa Publishing House.

CML 605(ii): Bio-Mathematics

Marks (Theory): 80

Marks (Internal Assessment) : 20

Marks(Total) : 100

Time : 3 Hrs

Note: Attempt five questions in all. The question paper will consist of **four** sections. **Question No. 1** will contain **seven** short answer type questions without any internal choice covering the entire syllabus and shall be **compulsory**. Each of the four sections **(I-IV)** will contain two questions and the students are required to attempt **one** question from each section. **All questions carry equal marks.**

Section-I

Population growth, Administration of drugs, Cell division. Modelling Biological Phenomena: Heart beat, Blood Flow, Nerve Impulse transmission, Chemical Reactions, Predator-prey models. Stability and oscillations: Epidemics, the phase plane, Local Stability, Stability, Limit Cycles, Forced oscillations, Computing trajectories.

Section-II

Mathematics of Heart Physiology: The local model, The Threshold effect, The phase plane analysis and the heart beat model, Physiological considerations of the heart beat model, A model of the cardiac pace-maker. Bifurcation and chaos: Bifurcation, Bifurcation of a limit cycle, Discrete bifurcation, Chaos, Stability, The Poincare plane.

Section-III

Mathematics of imaging of the Brain: Modelling of computerized tomography (CT, Magnetic resonance Imaging (MRI), Discrete analogues and Numerical Implementation. Networks in Biological Sciences: Dynamics of Small world networks, scale-free networks, complex networks, cellular automata.

Section-IV

Modelling Molecular Evolution: Matrix models of base substitutions for DNA sequences, The Jukes-Cantor Model, the Kimura Models, Phylogenetic distances. Constructing Phylogenetic trees: Unweighted pair-group method with arithmetic means (UPGMA), Neighbour- Joining Method, Maximum Likelihood approaches.

Recommended Books:

1. Elizabeth S. Allman and John a. Rhodes, Mathematical Models in Biology, Cambridge University Press, 2004.
2. C. Epstein, The Mathematics of Medical Imaging, Prentice Hall, 2003 (copyright Pearson Education, 2005).
3. S. Helgason, The Radon transform, Second Edition, Birkhauser, 1997.
4. D. S. Jones and B. D. Sleeman, Differential Equations and Mathematical Biology, Chapman & Hall, CRC Press, London, UK, 2003.
5. James Keener and James Sneyd, Mathematical Physiology, Springer Verlag, 1998, Corrected 2nd printing, 2001.

CML-606(i) Mechanics-II

Theory: 80

Marks (Internal Assessment): 20

Marks (Total): 100

Time: 3 Hrs

Note: Attempt five questions in all. The question paper will consist of four sections. **Question No. 1** will contain **seven** short answer type questions without any internal choice covering the entire syllabus and shall be compulsory. Each of the four sections (**I-IV**) will contain two questions and the students are required to attempt one question from each section. All questions carry equal marks.

Section - I

Analytical conditions of equilibrium of co-planar forces: Equilibrium of three forces, conditions of equilibrium, trigonometric theorem's, conditions of equilibrium of co-planar forces (First, Second and Third form); Friction: Definition of friction and basic laws, problems based on equilibrium of rods and ladders; Centre of gravity: Basic concepts and definitions, centre of gravity of a uniform rod, a thin uniform lamina in the form of a parallelogram, a thin uniform triangular lamina, three uniform rods forming a triangle, a uniform quadrilateral lamina, lamina in the form of a trapezium, centre of gravity of a body by integration.

Section - II

Motion of a particle attached to an elastic string, Hooke's law, motion of horizontal and vertical elastic strings, Definition of work, Power and Energy, work done by a variable force, work done in stretching an elastic string, principle of work and energy, conservative system of forces, principle of conservation of energy, impulse of a constant force and a variable force.

Section - III

Motion of a particle on smooth curves, motion on the outside and inside of a smooth vertical circle, cycloidal motion, motion on a rough curve under gravity.

Section - IV

Projectile motion of a particle in a plane, velocity at any point of the trajectory, directions of projection for a particle, range and time of flight on an inclined plane, directions of projection for a given velocity and a given range; range and time of flight down an inclined plane.

Books Recommended:

1. S.L. Loney: Statics, Macmillan Company, London.
2. R.S. Verma: A Text Book on Statics, Pothishala Pvt. Ltd., Allahabad
3. S.L. Loney, An Elementary Treatise on the Dynamics of a Particle and a Rigid Bodies, Cambridge University Press, 1956.
4. F. Chorlton, Dynamics, CBS Publishers, New Delhi.
5. A.S. Ramsey, Dynamics Part-1&2, CBS Publisher & Distributors.

CML-606(ii): Queuing and Reliability Theory

Marks (Theory): 80

Marks(Total) : 100

Marks (Internal Assessment) : 20

Time : 3 Hrs

Note: Attempt five questions in all. The question paper will consist of **four** sections. **Question No. 1** will contain **seven** short answer type questions without any internal choice covering the entire syllabus and shall be **compulsory**. Each of the four sections **(I-IV)** will contain two questions and the students are required to attempt **one** question from each section. **All questions carry equal marks.**

Section-I

General concepts of queueing system and Introduction to stochastic processes, Measures of performance, Arrival and Service processes, Kendall's notation, Single server and multi server models. channels in parallel with limited and unlimited queues --M/M/1/K, M/M/C.

Section-II

Queues with unlimited service, Finite source queues, Applications of Simple Queuing Decision Models, Design and Control Models.

Reliability concepts – Systems of components. Series and parallel systems – Coherent structures and their representation in terms of paths and cuts, Modular decomposition.

Section-III

Reliability of coherent systems – Reliability of Independent components, association of random variables, bounds on systems reliability and improved bounds on system reliability under modular decomposition.

Section-IV

Life Distribution: Survival function – Notion of aging IFR, DFR, DFRA, NBU and NBUE classes, Exponential distributions and its no-ageing property, ageing properties of other common life distribution, closures under formation of coherent structures, convolutions and mixtures of these cases. Reliability estimation: Estimation of two and three parameter Gamma, Weibull and log normal distributions.

Recommended Books:

1. D. Gross and C. Harris, Fundamentals of Queueing Theory, 3rd Edition, Wiley, 1998. (WSE Edition, 2004).
2. J. Medhi, Stochastic Models in Queueing Theory, 2nd Edition, Academic Press, 2003. (Elsevier India Edition, 2006).
3. John G. Rau, Optimization and Probability in Systems Engineering, V. N. Reinhold Co. 1970.
4. L. Kleinrock, Queueing Systems, Vol. 1: Theory, Wiley, 1975.
5. Marvin Rausand and Arnljot Hoyland, System Reliability Theory: Models, Statistical Methods and Applications, 2nd Ed. John Wiley and Sons Inc. 2003.
6. U N Bhatt: An Introduction to Queueing Theory: Modeling and Analysis in Applications (Statistics for Industry and Technology), Birkhauser Boston, 2008.

CML-607 (i): Real and Complex Analysis

Marks (Theory): 80

Marks: Internal Assessment (20)

Marks (Total): 100

Time : 3 Hours

Note: Attempt five questions in all. The question paper will consist of four sections. **Question No. 1** will contain **seven** short answer type questions without any internal choice covering the entire syllabus and shall be compulsory. Each of the four sections (**I-IV**) will contain two questions and the students are required to attempt one question from each section. All questions carry equal marks.

SECTION-I

Definition and examples of metric spaces, neighborhoods, limit points, interior points, open and closed sets, closure and interior, boundary points, subspace of a metric space, equivalent metrics, Cauchy sequences, completeness, Cantor's intersection theorem.

SECTION-II

Baire's category theorem, Contraction Principle, continuous functions, uniform continuity, compactness for metric spaces, sequential compactness, Bolzano-Weierstrass Property, total boundedness, finite intersection property, continuity in relation with compactness, connectedness.

SECTION-III

Improper integrals and their convergence, comparison tests, Abel's and Dirichlet's tests, Frullani's integral, Integral as a function of a parameter. Continuity, differentiability and integrability of an integral of a function of a parameter.

SECTION-IV

Topology of complex numbers: Trigonometric, exponential, logarithmic and hyperbolic trigonometric functions. Extended complex plane, Stereographic projection of complex numbers. Continuity and differentiability of complex functions. Analytic functions, Cauchy-Riemann equations, harmonic conjugates, harmonic functions. Construction of analytic functions: direct method and Milne-Thomson method.

Books Recommended

1. T.M. Apostol, Mathematical Analysis, Narosa Publishing House, New Delhi, 1985.
2. R.R. Goldberg, Methods of Real Analysis, John Wiley and Sons, Inc., New York, 1976.
3. D. Somasundaram and B. Choudhar: A First Course in Mathematical Analysis, Narosa Publishing House, New Delhi, 1997.
4. M.D. Raisinghania, Elements of Real Analysis, S.Chand Publication, 2003.
5. R.G. Bartle and D.R. Shernert: Introduction to Real Analysis, Wiley, 2011.
6. H.A. Priestly, Introduction to Complex Analysis, Clarendon Press, Oxford, 1990.
7. L.V. Ahlfors, Complex Analysis, McGraw-Hill, 1979.

CML-607(ii): Optimization Techniques

Marks (Theory): 80

Marks (Total): 100

Marks (Internal Assessment): 20

Time : 3 Hrs

Note: Attempt five questions in all. The question paper will consist of **four** sections. **Question No. 1** will contain **seven** short answer type questions without any internal choice covering the entire syllabus and shall be **compulsory**. Each of the four sections **(I-IV)** will contain two questions and the students are required to attempt **one** question from each section. **All questions carry equal marks.**

Section-I

Dynamic programming: Multistage decision processes, Recursive nature of computations, Forward and Backward recursion, Bellman's principle of optimality, Selective dynamic programming applications involving additive and multiplicative separable returns for objectives as well as constraint functions, Problem of dimensionality.

Goal Programming: Weighted and pre-emptive goal programming, graphical solution.

Section-II

Decision Analysis: Decision making under risk- Decision tree analysis, Posterior (Baye's) probabilities, Decision under uncertainty- criterion of pessimism, criterion of optimism, Laplace criterion, criterion of realism, criterion of regret.

Section-III

General concepts of queueing system, Measures of performance, Arrival and service Processes, Single server and multi server models, channel in parallel with limited and unlimited queues- M/M/1/K, M/M/C. Queues with unlimited service. Finite source queues. Applications of simple queueing decision model's, Design and control models.

Section-IV

Basics of reliability. Classes of life distributions. Series, parallel configuration. Reliability models, Reliability, Mean time before failure and Hazard rate of Exponential and Weibull distributions. Concepts and definitions of preventive maintenance, corrective maintenance and age replacement.

Books Recommended

1. R.B. Cooper, *Introduction to Queueing Theory*, 2nd Ed., North Holland, 1981.
2. D. Gross, C.M. Harris, *Fundamentals of Queueing Theory*, 3rd Ed., John Wiley and Sons Inc. P. Ltd., 2002.
3. U.N. Prabhu, *Foundations of Queueing Theory*, International Series in Operations & Management Science, Kluwer Academic Publishers, 2nd Ed., 2002.
4. John G. Rau, *Optimization and Probability in Systems Engineering*, V.N. Reinhold Co., 1970.
5. Riccardo Manzini, Alberto Regattieri, Hoang Pham, Emilio Ferrai, *Maintenance for Industrial Systems*, Springer-Verlag, London Limited, 2010.
6. P.K. Kapur, R.B. Garg, S. Kumar, *contributions to Hardware and Software Reliability*, World Scientific, Singapore, 1999.

CMS-608(i): Solid Geometry

Marks (Theory): 50

Marks (Internal Assessment) : 50

Marks(Total) : 100

Time : 2 Hrs

Note: *The examiner is requested to set five questions in all, selecting two questions from each UNIT and one compulsory question (Question No.1 based on entire syllabus will consist of five short answer type questions each of two marks). The candidate is required to attempt three questions in all selecting one from each UNIT and the compulsory Question No.1. All questions carry equal marks.*

UNIT-I

Central Conicoids: Equation of tangent plane. Director sphere. Normal to the conicoids. Polar plane of a point. Enveloping cone of a coinoid. Enveloping cylinder of a coinoid.

UNIT-II

Paraboloids: Circular section, Plane sections of conicoids. Generating lines. Confocal conicoid. Reduction of second degree equations.

Books Recommended:

1. R.J.T. Bill, Elementary Treatise on Coordinary Geometry of Three Dimensions, MacMillan India Ltd. 1994.
2. P.K. Jain and Khalil Ahmad: A Textbook of Analytical Geometry of Three Dimensions, Wiley Eastern Ltd. 1999.

CMS-608(ii)

Skill Enhancement Course

Financial Mathematics

Credits: 02; 30 Hrs (2Hrs /week)

Marks (Theory): 50

Marks (Internal Assessment) : 50

Marks (Total) : 100

Time : 2 Hrs

Note: *The examiner is requested to set five questions in all, selecting two questions from each UNIT and one compulsory question (Question No.1 based on entire syllabus will consist of five short answer type questions each of two marks). The candidate is required to attempt three questions in all selecting one from each UNIT and the compulsory Question No.1.*

UNIT-I

Basic principles: Comparison, arbitrage and risk aversion, Interest (simple and compound, discrete and continuous), time value of money, inflation, net present value, internal rate of return (calculation by bisection and Newton-Raphson methods), comparison of NPV and IRR.

UNIT-II

Bonds, bond prices and yields, Macaulay and modified duration, term structure of interest rates: spot and forward rates, explanations of term structure, running present value, floating-rate bonds, immunization, convexity, puttable and callable bonds.

Recommended Books:

1. David G. Luenberger, Investment Science, Oxford University Press, Delhi, 1998.
2. John C. Hull, Options, Futures and Other Derivatives (6th Edition), PrenticeHall India, Indian reprint, 2006.
3. Sheldon Ross, An Elementary Introduction to Mathematical Finance (2nd Edition), Cambridge University Press, USA, 2003

**Proposed Scheme of Programme for
Dual Degree B.Sc. (Hons) Mathematics – M.Sc. Mathematics
under Choice Based Credit System (w.e.f. 2016-2017)**

Semester-I

Course Opted	Paper Code	Nomenclature	Credit	Hours/ Week	Marks		
					External	Internal	Total
Ability Enhancement Compulsory Course-I	BXL 101	English	2	2	70	30	100
Ability Enhancement Compulsory Course-II	BXL 102	Environmental Sciences	2	2	70	30	100
Bridge Course-I	BML 101	Elementary Mathematics - I	4	4	70	30	100
Core Course-I	BML 102	Mathematics – I: Basic Algebra	4	4	70	30	100
Generic Elective-I	BPL 101	Physics-I: Mechanics	4	4	70	30	100
Generic Elective-II	BCL 101	Chemistry-I	4	4	70	30	100
Generic Elective-III	BBL 101	Elementary Biology-I	4	4	70	30	100
Generic Elective Practical-I	BPP 101	Physics Lab-I	2	4	70	30	100
Generic Elective Practical-II	BCP 101	Chemistry lab-I	2	4	70	30	100
Generic Elective Practical-III	BBP 101	Biology Lab	2	4	70	30	100
Total Credits = 26, Total hours =32							

Note: (i) Students, who have not studied Mathematics at 10+1 and 10+2 level, will opt the paper BML 101 and students, who have studied Mathematics at 10+1 and 10+2 level, will opt the paper BML 102.

(ii) Paper code BML 101 is offered by the Dept. of Mathematics for the students of other Departments.

(iii) Semesters I and II will be common for all the four programmes.

Semester-II

Course Opted	Paper Code	Nomenclature	Credit	Hours/ Week	Max. Marks		
					External	Internal	Total
Ability Enhancement Compulsory Course-III	BXL 201	Hindi	2	2	70	30	100
Bridge Course-II	BML 201	Elementary Mathematics – II	4	4	70	30	100
Core Course-II	BML 202	Mathematics-II: Calculus	4	4	70	30	100
Generic Elective-IV	BPL 201	Physics –II: Waves and Optics	4	4	70	30	100
Generic Elective-V	BCL 201	Chemistry – II	4	4	70	30	100
Generic Elective- VI	BBL 201	Elementary Biology - II	4	4	70	30	100
Generic Elective-VII	BXL 202	Computer Science	2	2	70	30	100
Generic Elective Practical- IV	BPP 201	Physics Lab - II	2	4	70	30	100
Generic Elective Practical- V	BCP 201	Chemistry Lab - II	2	4	70	30	100
Generic Elective Practical- VI	BXP 201	Computer Science-Lab	2	4	70	30	100
Total Credits = 26, Total hours = 32							

Note: (i) Students, who have not studied Mathematics at 10+1 and 10+2 level, will opt the paper BML 201 and students, who have studied Mathematics at 10+1 and 10+2 level, will opt the paper BML 202.

(ii) Paper code BML 201 is offered by the Dept. of Mathematics for the students of other Departments.

Semester-III

Course Opted	Paper Code	Nomenclature	Credit	Hours/ Week	Max. Marks		
					External	Internal	Total
Core Course- III	BML 301	Number Theory and Trigonometry	5	5	70	30	100
Core Course -IV	BML 302	Ordinary Differential Equations	5	5	70	30	100
Core Course- V	BML 303	Advanced Calculus	5	5	70	30	100
Core Course -VI	BML 304	Vector Calculus	5	5	70	30	100
Core Course- VII	BML 305	Mathematical Statistics	5	5	70	30	100
Skill Enhancement Course- I	BML 306	Special Functions-I	2	2	36	14	50
Total Credits = 27, Total hours = 27							

Semester-IV

Course Opted	Paper Code	Nomenclature	Credit	Hours/ Week	Max. Marks		
					External	Internal	Total
Core Course -VIII	BML 401	Solid Geometry	5	5	70	30	100
Core Course- IX	BML 402	Transform Techniques	5	5	70	30	100
Core Course- X	BML 403	Elementary Partial Differential Equations	5	5	70	30	100
Core Course- XI	BML 404	Statics	5	5	70	30	100
Core Course- XII	BML 405	Operations Research-I	5	5	70	30	100
Skill Enhancement Course- II	BML 406	Special Functions-II	2	2	36	14	50
Total Credits = 27, Total hours = 27.							

Semester-V

Course Opted	Paper Code	Nomenclature	Credit	Hours /Week	Max. Marks		
					External	Internal	Total
Core Course- XIII	BML 501	Real Analysis	5	5	70	30	100
Core Course- XIV	BML 502	Groups and Rings	5	5	70	30	100
Core Course- XV	BML 503	Programming in C & Numerical Methods	5	5	70	30	100
Core Course Practical- XV	BMP 504	Programming in C & Numerical Methods - Lab	2	4	35	15	50
Discipline Specific Elective -I	BML 505	Sequences and Series	5	5	70	30	100
Discipline Specific Elective- II	BML 506	Operations Research-II	5	5	70	30	100
Total Credits = 27, Total hours = 29							

Semester-VI

[illegible]

Paper Code	Nomenclature	No. of Credits	External Marks	Internal Marks	Total Marks
Semester VII					
MAL 511	Algebra	5 credits (5-0-0)	70	30	100
MAL 512	Real Analysis	5 credits (5-0-0)	70	30	100
MAL 513	Mechanics	5 credits (5-0-0)	70	30	100
MAL 514	Ordinary Differential Equations-I	5 credits (5-0-0)	70	30	100
MAL 515	Complex Analysis-I	5 credits (5-0-0)	70	30	100
MAL 516	Programming with FORTRAN (Theory)	5 credits (5-0-0)	70	30	100
MAP 517	Programming with FORTRAN (Practical)	1.5 credits (0-0-3)	70	30	100
	Total Credits	31.5 credits			
Semester VIII					
MAL 521	Abstract Algebra	5 credits (5-0-0)	70	30	100
MAL 522	Measure & Integration Theory	5 credits (5-0-0)	70	30	100
MAL 523	Methods of Applied Mathematics	5 credits (5-0-0)	70	30	100
MAL 524	Ordinary Differential Equations-II	5 credits (5-0-0)	70	30	100
MAL 525	Complex Analysis-II	5 credits (5-0-0)	70	30	100
MAL 526	Programming in C (Theory)	5 credits (5-0-0)	70	30	100
MAP 527	Computing Lab-I	1.5 credits (0-0-3)	70	30	100
	Total Credits	31.5 credits			
Semester IX					
MAL 631	Topology	5 credits (5-0-0)	70	30	100
MAL 632	Partial Differential Equations	5 credits (5-0-0)	70	30	100
MAL 633	Mechanics of Solids-I	5 credits (5-0-0)	70	30	100
MAP 634	Computing Lab-II	1.5 credits (0-0-3)	70	30	100
	Programme Elective-I	5 credits (5-0-0)	70	30	100
	Programme Elective-2	5 credits (5-0-0)	70	30	100
	Open Elective	4 credits (4-0-0)	70	30	100
	Total Credits	30.5 credits			
Semester X					
MAL 641	Functional Analysis	5 credits (5-0-0)	70	30	100
MAL 642	Differential Geometry	5 credits (5-0-0)	70	30	100
MAL 643	Mechanics of Solids-II	5 credits (5-0-0)	70	30	100
	Programme Elective-3	5 credits (5-0-0)	70	30	100
	Programme Elective-4	5 credits (5-0-0)	70	30	100
MAP 648	Computing Lab-3	1.5 credits (0-0-3)	70	30	100
	Total Credits	26.5 credits			
*Programme Electives					
Semester-IX					
MAL 635	Analytic Number Theory	5 credits (5-0-0)	70	30	100
MAL 636	Fluid Mechanics	5 credits (5-0-0)	70	30	100
MAL 637	Advanced Discrete Mathematics	5 credits (5-0-0)	70	30	100
MAL 638	Difference Equations	5 credits (5-0-0)	70	30	100
MAO 630	Open Elective	4 credits (4-0-0)	70	30	100
Semester-X					
MAL 644	Integral Equations	5 credits (5-0-0)	70	30	100
MAL 645	Advanced Fluid Mechanics	5 credits (5-0-0)	70	30	100
MAL 646	Bio-Mechanics	5 credits (5-0-0)	70	30	100
MAL 647	Algebraic Coding Theory	5 credits (5-0-0)	70	30	100
*Programme/ open electives can be offered subject to availability of requisite resources/faculty in the department.					

Total Credits: 120 +160 = 280

Semester-I

Course Opted	Paper Code	Nomenclature	Credit	Hours/ Week	Marks		
					External	Internal	Total
Ability Enhancement Compulsory Course-I	BXL 101	English	2	2	70	30	100
Ability Enhancement Compulsory Course-II	BXL 102	Environmental Sciences	2	2	70	30	100
Bridge Course-I	BML 101	Elementary Mathematics - I	4	4	70	30	100
Core Course-I	BML 102	Mathematics – I: Basic Algebra	4	4	70	30	100
Generic Elective-I	BPL 101	Physics-I: Mechanics	4	4	70	30	100
Generic Elective-II	BCL 101	Chemistry-I	4	4	70	30	100
Generic Elective-III	BBL 101	Elementary Biology-I	4	4	70	30	100
Generic Elective Practical-I	BPP 101	Physics Lab-I	2	4	70	30	100
Generic Elective Practical-II	BCP 101	Chemistry lab-I	2	4	70	30	100
Generic Elective Practical-III	BBP 101	Biology Lab	2	4	70	30	100
Total Credits = 26, Total hours =32							

Note: (i) Students, who have not studied Mathematics at 10+1 and 10+2 level, will opt the paper BML 101 and students, who have studied Mathematics at 10+1 and 10+2 level, will opt the paper BML 102.

(ii) Paper code BML 101 is offered by the Dept. of Mathematics for the students of other Departments.

(iii) Semesters I and II will be common for all the four programmes.

BXL 101: English**Marks (Theory) : 70****Marks(Total) : 100****Marks (Internal Assessment) : 30****Time : 3 Hrs**

Note: The examiner is requested to set nine questions in all, selecting two questions from each unit and one compulsory question (Question No.1 based on entire syllabus will consist of seven short answer type questions each of two marks). The candidate is required to attempt five questions in all selecting one from each unit and the compulsory Question No.1.

Unit-I**Syntax****7Hrs**

Sentence structures, Verb patterns and their usage

Unit-II**Phonetics****8Hrs**

Basic Concepts – Vowels, Consonants, Phonemes, Syllables; Articulation of Speech Sounds – Place and Manner of Articulation; Transcription of words and simple sentences, using International Phonetic Alphabet.

Unit-III**Comprehension****7Hrs**

Listening and Reading comprehension – Note taking, Reviewing, Summarizing, Interpreting, Paraphrasing and Précis Writing.

Unit-IV**Composition****8Hrs**

Descriptive, Explanatory, Analytical and Argumentative Writing - description of simple objects like instruments, appliances, places, persons, principles; description and explanation of processes and operations; analysis and arguments in the form of debate and group discussion.

BOOKS SUGGESTED:

1. Roy A. & Sharma P.L. English for Students of Science, Orient Longman.
2. Spoken English for India by R.K. Bansal and J.B. Harrison, Orient Longman.
3. Tickoo M.L. & Subramanian A.E. Intermediate Grammar, Usage and Composition, Orient Longman.
4. Pink M.A. & Thomas S.E. English Grammar, Composition and Correspondence, S. Chand and Sons Pvt.Ltd., Delhi.
5. Thomson & Martinet A Practical English Grammar, OUP, Delhi.
6. Hornby A.S Guide to Patterns and Usage in English, OUP, Delhi.
7. Balasubramanian T. A Textbook of English Phonetics for Indian Students, MacMillan, Chennai.
8. O'Connor J.D. Better English Pronunciation, Cambridge Univ. Press, London.
9. McCarthy English Vocabulary in Use, Foundation Books (Cambridge University Press), Delhi.
10. Buck, Assessing Listening, Foundation Books (Cambridge University Press), Delhi.

BXL 102 : Environmental Science

Marks (Theory) : 70

Marks (Internal Assessment) : 30

Marks(Total) : 100

Time : 3 Hrs

Note: The examiner is requested to set nine questions in all, selecting two questions from each unit and one compulsory question (Question No.1 based on entire syllabus will consist of seven short answer type questions each of two marks). The candidate is required to attempt five questions in all selecting one from each unit and the compulsory Question No.1.

Unit-I

The Multidisciplinary nature of environmental studies

8Hrs

Definition, scope and importance, Need for public awareness. Natural resources: Renewable and non-renewable resources. Natural resources and associated problems.

a) Forest resources: Use and over-exploitation, deforestation

b) Water resources: Use and over-utilization of surface and ground water, floods and drought.

c) Mineral resources: Use and exploitation, environmental effects of extruding.

d) Food resources: World food problems, changes caused by agriculture, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity.

e) Energy Resources: Growing energy needs, renewable and non renewable energy sources use of alternative energy sources.

f) Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification

Unit-II

Ecosystems

7Hrs

Concept of an ecosystem, Structure and function of an ecosystem, Procedures, consumers and decomposers, Energy flow in the ecosystem, Ecological succession & Food chains, food webs and ecological pyramids.

Biodiversity and its conservation: Introduction – Definition: genetic, species and ecosystem diversity, Biogeographical classification of India, Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values, Biodiversity at global, National and local levels, India as a megadiversity nation.

Unit-III

Environmental Pollution

7Hrs

Definition, Causes, effects and control measures of: - Air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution & Nuclear hazards. Solid waste Management: Causes, effects and control measures of urban and industrial wastes.

Unit-IV

Social Issues and the Environment

8Hrs

From Unsustainable to sustainable development, urban problems related to energy, Water conservation, rain water harvesting, watershed management, Resettlement and rehabilitation of people; its problems and concerns. Environmental ethics: Issues and possible solutions, Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust, Wasteland reclamation, Consumerism and waste products, environment Protection Act, Air (Prevention and Control of Pollution) Act, Water(Prevention and control of Pollution) Act, Wildlife Protection Act, Forest Conservation Act, Issues involved in enforcement of environment legislation & Public awareness.

BOOKS SUGGESTED:

1. De A. K. Environmental Chemistry, Wiley Eastern Ltd, 1999.
2. Bharucha E. Text book of Environmental studies, University press, Hydrabad 2005.
3. Cunningham W P., Cooper T H. Gorhani E. Hepworth M T, Environmental Enclopedia, Jaico publication House, Mumbai, 2001.
4. Miller T G. Environmental Science Wadsworth publishing corp, 2000.

BML 101 : Elementary Mathematics-I

Marks (Theory) : 70

Marks (Internal Assessment) : 30

Marks(Total) : 100

Time : 3 Hrs

Note: Attempt five questions in all. The question paper will consist of **four** sections. **Question No. 1** will contain **seven** short answer type questions without any internal choice covering the entire syllabus and shall be **compulsory**. Each of the four sections **(I-IV)** will contain two questions and the students are required to attempt **one** question from each section. **All questions carry equal marks.**

Section – I

Sets, Relations and Functions : Sets and their Representations, The Empty Set, Finite and Infinite Sets, Equal Sets, Subsets, Universal Set, Venn Diagrams, Operations on Sets, Complement of a Set, Practical Problems on Union and Intersection of Two Sets, Cartesian Product of Sets, Relations, Functions.

Sequences and Series : Sequences, Series, Arithmetic Progression (A.P.), Geometric Progression (G.P.), Relationship Between A.M. and G.M.

Section – II

Straight Lines : Introduction, Slope of a Line, Various Forms of the Equation of a Line, General Equation of a Line, Distance of a Point From a Line.

Trigonometric Functions : Angles, Trigonometric Functions, Trigonometric Functions of Sum and Difference of Two Angles, Trigonometric Equations.

Section – III

Permutations and Combinations : Fundamental Principle of Counting, Permutations, Combinations.

Binomial Theorem : Introduction, Binomial Theorem for Positive Integral Indices, General and Middle Terms.

Section – IV

Linear Inequalities : Inequalities, Algebraic Solutions of Linear Inequalities in One Variable and their Graphical Representation, Graphical Solution of Linear Inequalities in Two Variables, Solution of System of Linear Inequalities in Two Variables.

Probability : Introduction, Random Experiments, Event, Axiomatic Approach to Probability, Addition Theorems on Probability, Conditional Probability, Multiplicative Law of Probability.

Books Recommended:

1. Mathematics Text Book for Class XI, National Council of Educational Research and Training.
2. R.S. Verma and K.S. Sukla, Text Book on Trigonometry, Pothishala Pvt. Ltd, Allahabad.
3. S.C. Gupta and V.K. Kapoor, Fundamentals of Mathematical Statistics, S. Chand & Sons.
4. Ivo Duntsch and Gunther Gediga, Set, Relations, Functions, Methodos Publishers.

Marks (Theory) : 70

Marks (Internal Assessment) : 30

Marks(Total) : 100

Time : 3 Hrs

Note: Attempt five questions in all. The question paper will consist of **four** sections. **Question No. 1** will contain **seven** short answer type questions without any internal choice covering the entire syllabus and shall be **compulsory**. Each of the four sections **(I-IV)** will contain two questions and the students are required to attempt **one** question from each section. **All questions carry equal marks.**

Section – I

Symmetric, Skew-symmetric, Hermitian and skew Hermitian matrices. Elementary operations on matrices. Rank of a matrices. Inverse of a matrix. Linear dependence and independence of rows and columns of matrices. Row rank and column rank of a matrix. Eigenvalues, eigenvectors and the characteristic equation of a matrix. Minimal polynomial of a matrix. Cayley Hamilton theorem and its use in finding the inverse of a matrix.

Section – II

Applications of matrices to a system of linear (both homogeneous and non-homogeneous) equations. Theorems on consistency of a system of linear equations. Unitary and Orthogonal Matrices, Bilinear and Quadratic forms.

Section – III

Relations between the roots and coefficients of general polynomial equation in one variable. Solutions of polynomial equations having conditions on roots. Common roots and multiple roots. Transformation of equations.

Section – IV

Nature of the roots of an equation, Descarte's rule of signs. Solutions of cubic equations (Cardon's method). Biquadratic equations and their solutions.

Books Recommended :

1. H.S. Hall and S.R. Knight, Higher Algebra, H.M. Publications 1994.
2. Shanti Narayan, A Text Books of Matrices.
3. Chandrika Prasad, Text Book on Algebra and Theory of Equations. Pothishala Private Ltd., Allahabad.

Marks (Theory) : 70
Marks (Internal Assessment) : 30

Marks(Total) : 100
Time : 3 Hrs

Note: The question paper will consist of nine questions in all. Question no. 1 will contain seven short answer type questions without any internal choice covering the entire syllabus and shall be compulsory. The remaining eight questions will be set from the four units with two questions from each unit. Candidate is required to attempt five questions in all with one compulsory question and one question from each unit.

UNIT – 1

Fundamentals of Dynamics: Reference frames. Inertial frames; Review of Newton's Laws of Motion. Galilean transformations; Galilean invariance. Momentum of variable mass system: motion of rocket. Motion of a projectile in Uniform gravitational field Dynamics of a system of particles. Centre of Mass. Principle of conservation of momentum. Impulse.

Work and Energy: Work and Kinetic Energy Theorem. Conservative and non-conservative forces. Potential Energy. Energy diagram. Stable and unstable equilibrium. Elastic potential energy. Force as gradient of potential energy. Work & Potential energy. Work done by non-conservative forces. Law of conservation of Energy.

Collisions: Elastic and inelastic collisions between particles. Centre of Mass and Laboratory frames.

UNIT - 2

Rotational Dynamics: Angular momentum of a particle and system of particles. Torque. Principle of conservation of angular momentum. Rotation about a fixed axis. Moment of Inertia. Calculation of moment of inertia for rectangular, cylindrical and spherical bodies. Kinetic energy of rotation. Motion involving both translation and rotation.

Elasticity: Relation between Elastic constants. Twisting torque on a Cylinder or Wire.

Fluid Motion: Kinematics of Moving Fluids: Poiseuille's Equation for Flow of a Liquid through a Capillary Tube.

UNIT – 3

Gravitation and Central Force Motion: Law of gravitation. Gravitational potential energy. Inertial and gravitational mass. Potential and field due to spherical shell and solid sphere. Motion of a particle under a central force field. Two-body problem and its reduction to one-body problem and its solution. The energy equation and energy diagram. Kepler's Laws. Satellite in circular orbit and applications. Geosynchronous orbits. Weightlessness. Basic idea of global positioning system (GPS).

Oscillations: SHM: Simple Harmonic Oscillations. Differential equation of SHM and its solution. Kinetic energy, potential energy, total energy and their time-average values. Damped oscillation. Forced oscillations: Transient and steady states; Resonance, sharpness of resonance; power dissipation and Quality Factor.

UNIT - 4

Non-Inertial Systems: Non-inertial frames and fictitious forces. Uniformly rotating frame. Laws of Physics in rotating coordinate systems. Centrifugal force. Coriolis force and its applications. Components of Velocity and Acceleration in Cylindrical and Spherical Coordinate Systems.

Special Theory of Relativity: Michelson-Morley Experiment and its outcome. Postulates of Special Theory of Relativity. Lorentz Transformations. Simultaneity and order of events. Lorentz contraction. Time dilation. Relativistic transformation of velocity, frequency and wave number. Relativistic addition of velocities. Variation of mass with velocity. Massless Particles. Mass-energy Equivalence. Relativistic Doppler effect. Relativistic Kinematics. Transformation of Energy and Momentum.

Reference Books:

1. An introduction to mechanics, D. Kleppner, R.J. Kolenkow, 1973, McGraw-Hill.
2. Mechanics, Berkeley Physics, vol.1, C.Kittel, W.Knight, et.al. 2007, Tata McGraw-Hill.
3. Physics, Resnick, Halliday and Walker 8/e. 2008, Wiley.
4. Analytical Mechanics, G.R. Fowles and G.L. Cassiday. 2005, Cengage Learning.
5. Feynman Lectures, Vol. I, R.P.Feynman, R.B.Leighton, M.Sands, 2008, Pearson Education
6. Introduction to Special Relativity, R. Resnick, 2005, John Wiley and Sons.
7. University Physics, Ronald Lane Reese, 2003, Thomson Brooks/Cole.

Additional Books for Reference

- 1) Mechanics, D.S. Mathur, S. Chand and Company Limited, 2000
- 2) University Physics. F.W Sears, M.W Zemansky, H.D Young 13/e, 1986, Addison Wesley
- 3) Physics for scientists and Engineers with Modern Phys., J.W. Jewett, R.A. Serway, 2010, Cengage Learning
- 4) Theoretical Mechanics, M.R. Spiegel, 2006, Tata McGraw Hill.

BCL 101: CHEMISTRY-I

Marks (Theory) : 70

Marks (Internal Assessment) : 30

Marks(Total) : 100

Time : 3 Hrs

Note: The examiner is requested to set nine questions in all, selecting two questions from each unit and one compulsory question (Question No.1 based on entire syllabus will consist

of seven short answer type questions each of two marks). The candidate is required to attempt five questions in all selecting one from each unit and the compulsory Question No.1.

UNIT-I

Chemical Thermodynamics

15 Hrs

Objectives and limitations of Chemical Thermodynamics, state functions, thermodynamic equilibrium, work, heat, internal energy, enthalpy. First Law of Thermodynamics: First law of thermodynamics for open, closed and isolated systems. Reversible isothermal and adiabatic expansion/compression of an ideal gas. Irreversible isothermal and adiabatic expansion. Enthalpy change and its measurement, standard heats of formation and absolute enthalpies. Kirchhoff's equation.

Second and Third Law: Various statements of the second law of thermodynamics. Efficiency of a cyclic process (Carnot's cycle). Entropy: Entropy changes of an ideal gas with changes in P, V, and T. Free energy and work functions. Gibbs-Helmholtz Equation, Criteria of spontaneity in terms of changes in free energy. Introduction to Third law of thermodynamics.

UNIT-II

Conductance and Electrochemistry

15 Hrs

Arrhenius theory of electrolytic dissociation. Conductivity, equivalent and molar conductivity and their variation with dilution for weak and strong electrolytes. Molar conductivity at infinite dilution. Kohlrausch law of independent migration of ions.

Ionic velocities, mobilities and their determinations, transference numbers and their relation to ionic mobilities, determination of transference numbers using Hittorf and Moving Boundary methods. Applications of conductance to measure degree of dissociation of weak electrolytes.

Quantitative aspects of Faraday's laws of electrolysis, rules of oxidation/reduction of ions based on half cell potentials, application of electrolysis in metallurgy and industry. Chemical cells with examples; Standard electrode (reduction) potential.

UNIT-III

Fundamentals of Organic Chemistry

15 Hrs

Electronic Displacements: Inductive Effect, Electromeric Effect, Resonance and Hyperconjugation.

Cleavage of Bonds: Homolysis and Heterolysis.

Structure, shape and reactivity of organic molecules: Nucleophiles and electrophiles.

Reactive Intermediates: Carbocations, Carbanions and free radicals.

Strength of organic acids and bases: Comparative study with emphasis on factors affecting pK values.

UNIT-IV

Stereochemistry

8 Hrs

Conformations with respect to ethane, butane and cyclohexane. Interconversion of Wedge Formula, Newmann, Sawhorse and Fischer representations. Concept of chirality (upto two carbon atoms). Configuration: Geometrical and Optical isomerism; Enantiomerism, Diastereomerism and Meso compounds). Threo and erythro; D and L; *cis-trans* nomenclature; CIP Rules: R / S (for upto 2 chiral carbon atoms) and E / Z Nomenclature (for upto two C=C systems).

Chemistry of Biomolecules

7 Hrs

Occurrence, classification of Carbohydrates. Amino acids, peptides and their classification. α -Amino Acids. Zwitterions, pK_a values, isoelectric point, components of nucleic acids, nucleosides and nucleotides.

BOOKS SUGGESTED:

1. Atkins, P.W. & Paula, J. *Physical Chemistry*, 10th Ed., Oxford University Press, 2014.
2. Castellan, G.W., *Physical Chemistry*, Narosa Publishers
3. Morrison, R. N. & Boyd, R. N. *Organic Chemistry*, Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
4. Finar, I. L. *Organic Chemistry (Volume 1)*, Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
5. Finar, I. L. *Organic Chemistry (Volume 2: Stereochemistry and the Chemistry of Natural Products)*, Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
6. Eliel, E. L. & Wilen, S. H. *Stereochemistry of Organic Compounds*, Wiley: London, 1994.
7. Kalsi, P. S. *Stereochemistry Conformation and Mechanism*, New Age International, 2005.
8. McMurry, J.E. *Fundamentals of Organic Chemistry*, 7th Ed. Cengage Learning India Edition, 2013.

BBL 101 : Elementary Biology-I

(Fundamentals of Biology)

Marks (Theory) : 70

Marks (Internal Assessment) : 30

Marks (Total) : 100

Time : 3 Hrs

Note: Attempt five questions in all. The question paper will consist of **four** sections. **Question No. 1** will contain **seven** short answer type questions without any internal choice

covering the entire syllabus and shall be **compulsory**. Each of the four sections (I-IV) will contain two questions and the students are required to attempt **one** question from each section. **All questions carry equal marks.**

Section - I

Introduction to concepts of biology

Themes in the study of biology; A closer look at ecosystem; A closer look at cell; The process of

Science; Biology and everyday life

Evolutionary history of biological diversity

Early earth and the origin of life; Major events in the history of life; Mechanism of Macroevolution; Phylogeny and the tree of life

Section - II

Classifying the diversity of life

Kingdoms of Life –Prokaryotes, Eukaryotes, Archaea

Darwinian view of life and origin of species

Darwin's theory of evolution; The evolution of populations; Concepts of species; Mechanism of speciation

Genetic approach to Biology

Patterns of inheritance and question of biology; Variation on Mendel's Law; The molecular basis of genetic information; The flow of genetic information from DNA to RNA to protein; Genetic Variation; Methodologies used to study genes and gene activities; Developmental noise; Detecting macromolecules of genetics; Model organisms for the genetic analysis; Distinction between Phenotype and Genotype.

Section - III

Chemistry of life

The constituents of matter; Structure of an atom; The energy level of electron; The formation and

function of molecules depend on chemical bonding between atoms; Chemical reaction make or break chemical bonds

Water and life

The water molecule is polar; Properties of water; Ionization of water

Carbon and life

Organic chemistry-the study of carbon compounds; what makes carbon special? Properties of organic compounds

Section – IV

Structure and function of biomolecules

Most macromolecules are Polymers; Carbohydrates act as fuel and building materials; Lipids are

group of hydrophobic molecules; Protein have diverse structures and functions; Nucleic acids store and transmit hereditary information

SUGGESTED READING/BOOKS

1. Campbell, N.A. and Reece, J. B. (2008) Biology 8th edition, Pearson Benjamin Cummings, San Francisco.
2. Raven, P.H et al (2006) Biology 7th edition Tata McGrawHill Publications, New Delhi
3. Griffiths, A.J.F et al (2008) Introduction to Genetic Analysis, 9th edition, W.H. Freeman & Co. NY

BPP-101: Physics Lab – I

Marks (Theory) : 70

Marks (Internal Assessment) : 30

Marks(Total) : 100

Time : 3 Hrs

(Credits: 02)

1. Measurements of length (or diameter) using vernier caliper, screw gauge and travelling microscope.
2. To study the random error in observations.
3. To determine the height of a building using a Sextant.
4. To study the Motion of Spring and calculate (a) Spring constant, (b) g and (c) Modulus of rigidity.
5. To determine the Moment of Inertia of a Flywheel.
6. To determine g and velocity for a freely falling body using Digital Timing Technique;
7. To determine Coefficient of Viscosity of water by Capillary Flow Method (Poiseuille's method).
8. To determine the Young's Modulus of a Wire by Optical Lever Method.
9. To determine the Modulus of Rigidity of a Wire by Maxwell's needle.
10. To determine the elastic Constants of a wire by Searle's method.
11. To determine the value of g using Bar Pendulum.
12. To determine the value of g using Kater's Pendulum.

Reference Books

1. Advanced Practical Physics for students, B. L. Flint and H.T. Worsnop, 1971, Asia Publishing House
2. Advanced level Physics Practicals, Michael Nelson and Jon M. Ogborn, 4th Edition reprinted 1985, Heinemann Educational Publishers
3. A Text Book of Practical Physics, I.Prakash & Ramakrishna, 11th Edn, 2011, Kitab Mahal
4. Engineering Practical Physics, S.Panigrahi & B.Mallick, 2015, Cengage Learning India Pvt. Ltd.
5. Practical Physics, G.L. Squires, 2015, 4th Edition, Cambridge University Press.

BCP 101: CHEMISTRY LAB-I

Marks (Theory) : 70

Marks (Internal Assessment) : 30

Marks(Total) : 100

Time : 3 Hrs

1. Preparation of reference solutions.

2. Redox titrations: Determination of Fe^{2+} , $\text{C}_2\text{O}_4^{2-}$ (using KMnO_4 , $\text{K}_2\text{Cr}_2\text{O}_7$)
3. Iodometric titrations: Determination of Cu^{2+} (using standard hypo solution).
4. To determine the surface tension of at least two liquids using stalagmometer by drop no. and drop weight methods (Use of organic solvents excluded).
5. To study the effect of surfactant on surface tension of water.
6. To determine the viscosity of at least two liquids by using Ostwald's viscometer (use of organic solvents excluded).
7. To study the process of (i) sublimation (ii) Crystallization of camphor and phthalic acid
8. Preparation and purification through crystallization or distillation and ascertaining their purity through melting point or boiling point
 - (i) Iodoform from ethanol (or acetone)
 - (ii) p-Bromoacetanilide from acetanilide

BOOKS SUGGESTED:

1. Vogel A. I., Tatchell A.R., Furnis B.S., Hannaford A.J., Smith P.W.G., Vogel's Text Book of Practical Organic Chemistry, 5th Edn., Pubs: ELBS, 1989.
2. Pavia D.L., Lampman G.M., Kriz G.S. Jr., Introduction to Organic Laboratory Techniques, 3rd Edn., Pubs: Thomson Brooks/Cole, 2005.
3. Mann F.G., Saunders P.C., Practical Organic Chemistry, Pubs: Green & Co. Ltd., London, 1978.
4. Svehla, G., Vogel's Qualitative Inorganic Analysis (revised); 7th edition, Pubs: Orient Longman, 1996.
5. Bassett, J., Denney, R.C., Jeffery, G.H., Mendham, J., Vogel's Textbook of Quantitative Inorganic Analysis (revised); 4th edition, Pubs: Orient Longman, 1978.
6. Yadav J. B., Advanced Practical physical Chemistry

BBP 101 : ELECTIVE PRACTICAL-II BIOLOGY LAB-I

Marks (Theory) : 70
Marks (Internal Assessment) : 30

Marks (Total) : 100
Time : 3 Hrs

PRACTICALS

1. To learn a) use of microscope b) principles of fixation and staining.
2. Preparation of Normal, molar and standard solutions, phosphate buffers, serial dilutions
3. Use of micropipettes
4. Measurement of cell size by cytometry
5. To perform gram staining of bacteria.
6. To study the cytochemical distribution of nucleic acids and mucopolysaccharides with in cells/tissues from permanent slides.
7. To perform quantitative estimation of protein using the Lowry's method. Determine the concentration of the unknown sample using the standard curve plotted.
8. To study of plasmolysis & deplamolysis of *Rhoeo* leaf.
9. To study prokaryotic cells, Bacteria/fungi and eukaryotic cells.
10. To prepare squash from root tip of *Alium cepa* & study various stages of mitosis.

Semester-II

Course Opted	Paper Code	Nomenclature	Credit	Hours/ Week	Max. Marks		
					External	Internal	Total
Ability Enhancement Compulsory	BXL 201	Hindi	2	2	70	30	100

Course-III							
Bridge Course-II	BML 201	Elementary Mathematics – II	4	4	70	30	100
Core Course-II	BML 202	Mathematics-II: Calculus	4	4	70	30	100
Generic Elective-IV	BPL 201	Physics –II: Waves and Optics	4	4	70	30	100
Generic Elective-V	BCL 201	Chemistry – II	4	4	70	30	100
Generic Elective- VI	BBL 201	Elementary Biology - II	4	4	70	30	100
Generic Elective-VII	BXL 202	Computer Science	2	2	70	30	100
Generic Elective Practical- IV	BPP 201	Physics Lab - II	2	4	70	30	100
Generic Elective Practical- V	BCP 201	Chemistry Lab - II	2	4	70	30	100
Generic Elective Practical- VI	BXP 201	Computer Science-Lab	2	4	70	30	100
Total Credits = 26, Total hours = 32							

Note: (i) Students, who have not studied Mathematics at 10+1 and 10+2 level, will opt the paper BML 201 and students, who have studied Mathematics at 10+1 and 10+2 level, will opt the paper BML 202.

(ii) Paper code BML 201 is offered by the Dept. of Mathematics for the students of other Departments.

BML 201 : Elementary Mathematics-II**Marks (Theory) : 70****Marks (Internal Assessment) : 30****Marks(Total) : 100****Time : 3 Hrs**

Note: Attempt five questions in all. The question paper will consist of **four** sections. **Question No. 1** will contain **seven** short answer type questions without any internal choice covering the entire syllabus and shall be **compulsory**. Each of the four sections **(I-IV)**

will contain two questions and the students are required to attempt **one** question from each section. **All questions carry equal marks.**

Section – I

Matrix Algebra : Introduction, types of matrices, addition and multiplication of matrix, transpose of matrix, concept of elementary row and column operations. Determinant and its properties, minors, cofactors. Application of determinants in finding area of triangle. Adjoint and inverse of square matrix. Solution of homogeneous and non-homogeneous linear equations and condition for solution.

Section – II

Differential Calculus : Differentiation of standard functions including function of a function (Chain rule). Differentiation of implicit functions, logarithmic differentiation, parametric differentiation, elements of successive differentiation.

Integral Calculus : Integration as inverse of differentiation, indefinite integrals of standard forms, integration by parts, partial fractions and substitution. Formal evaluation of definite integrals.

Section – III

Ordinary Differential Equations : Definition and formation of ordinary differential equations, equations of first order and first degree, variable separable, homogeneous equations, linear equations (Leibnitz form) and differential equations reducible to these types, Linear differential equation of order greater than one with constant coefficients, complementary function and particular integrals.

Section – IV

Partial Differential Equations: Introduction and formation of P.D.E., solution of P.D.E., linear equation of first order (Lagrange's Equation), Non-Linear Equation of first order.

Vector Calculus: Differentiation of vectors, scalar and vector point functions, gradient of scalar field and directional derivative, divergence and curl of vector field and their physical interpretation.

Books Recommended:

1. Shanti Narayan	: Differential and Integral Calculus, S. Chand.
2. S.L. Ross,	: Differential Equations, John Wiley and sons inc., Ny, 1984.
3. Shanti Narayan	: A Textbook of Matrices, S. Chand.
4. Ian N. Sneddon	: Elements of Partial Differential Equations, McGraw Hill.
5. Murray R. Spiegel	: Vector Analysis Schaum Publishing Company, New York

BML 202

Mathematics-II : Calculus

Marks (Theory) : 70

Marks (Internal Assessment) : 30

Marks(Total) : 100

Time : 3 Hrs

Note: Attempt five questions in all. The question paper will consist of **four** sections. **Question No. 1** will contain **seven** short answer type questions without any internal choice covering the entire syllabus and shall be **compulsory**. Each of the four sections **(I-IV)** will contain two questions and the students are required to attempt **one** question from each section. **All questions carry equal marks.**

Section – I

Definition of the limit of a function. Basic properties of limits, Continuous functions and classification of discontinuities. Differentiability. Successive differentiation. Leibnitz theorem. Maclaurin and Taylor series expansions.

Section – II

Asymptotes in Cartesian coordinates, intersection of curve and its asymptotes, asymptotes in polar coordinates. Curvature, radius of curvature for Cartesian curves, parametric curves, polar curves. Newton's method. Radius of curvature for pedal curves. Tangential polar equations. Centre of curvature. Circle of curvature. Chord of curvature, evolutes. Tests for concavity and convexity. Points of inflexion. Multiple points. Cusps, nodes & conjugate points. Type of cusps.

Section – III

Tracing of curves in Cartesian, parametric and polar co-ordinates. Reduction formulae. Rectification, intrinsic equations of curve.

Section – IV

Quadrature (area) Sectorial area. Area bounded by closed curves. Volumes and surfaces of solids of revolution. Theorems of Pappu's and Guilden.

Books Recommended :

1. Differential and Integral Calculus, Shanti Narayan.
2. Murray R. Spiegel, Theory and Problems of Advanced Calculus. Schaun's Outline series. Schaum Publishing Co., New York.
3. N. Piskunov, Differential and Integral Calculus. Peace Publishers, Moscow.
4. Gorakh Prasad, Differential Calculus. Pothishasla Pvt. Ltd., Allahabad.
5. Gorakh Prasad, Integral Calculus. Pothishala Pvt. Ltd., Allahabad.

BPL-201: PHYSICS – II: Waves and Optics

Marks (Theory) : 70

Marks (Internal Assessment) : 30

Marks(Total) : 100

Time : 3 Hrs

Note: The question paper will consist of nine questions in all. Question no. 1 will contain seven short answer type questions without any internal choice covering the entire syllabus and shall be compulsory. The remaining eight questions will be set from the four units with two questions from each unit. Candidate is required to attempt five questions in all with one compulsory question and one question from each unit.

UNIT - I

Superposition of Collinear Harmonic oscillations: Linearity and Superposition Principle. Superposition of two collinear oscillations having (1) equal frequencies and (2) different frequencies (Beats). Superposition of N collinear Harmonic Oscillations with (1) equal phase differences and (2) equal frequency differences.

Superposition of two perpendicular Harmonic Oscillations: Graphical and Analytical Methods. Lissajous Figures with equal and unequal frequency and their uses.

Wave Motion: Plane and Spherical Waves. Longitudinal and Transverse Waves. Plane Progressive (Travelling) Waves. Wave Equation. Particle and Wave Velocities. Differential Equation. Pressure of a Longitudinal Wave. Energy Transport. Intensity of Wave. Water Waves: Ripple and Gravity Waves.

UNIT - II

Velocity of Waves: Velocity of Transverse Vibrations of Stretched Strings. Velocity of Longitudinal Waves in a Fluid in a Pipe. Newton's Formula for Velocity of Sound. Laplace's Correction.

Superposition of Two Harmonic Waves: Standing (Stationary) Waves in a String: Fixed and Free Ends. Analytical Treatment. Phase and Group Velocities. Changes with respect to Position and Time. Energy of Vibrating String. Transfer of Energy. Normal Modes of Stretched Strings. Plucked and Struck Strings. Melde's Experiment. Longitudinal Standing Waves and Normal Modes. Open and Closed Pipes. Superposition of N Harmonic Waves.

Wave Optics: Electromagnetic nature of light. Definition and properties of wave front. Huygens Principle. Temporal and Spatial Coherence.

UNIT - III

Diffraction: Kirchhoff's Integral Theorem, Fresnel-Kirchhoff's Integral formula. (Qualitative discussion only)

Fraunhofer diffraction: Single slit. Circular aperture, Resolving Power of a telescope. Double slit. Multiple slits. Diffraction grating. Resolving power of grating.

Fresnel Diffraction: Fresnel's Assumptions. Fresnel's Half-Period Zones for Plane Wave. Explanation of Rectilinear Propagation of Light. Theory of a Zone Plate: Multiple Foci of a Zone Plate. Fresnel's Integral, Fresnel diffraction pattern of a straight edge, a slit and a wire.

UNIT -IV

Interference: Division of amplitude and wave front. Young's double slit experiment. Lloyd's Mirror and Fresnel's Biprism. Phase change on reflection: Stokes' treatment. Interference in Thin Films: parallel and wedge-shaped films. Fringes of equal inclination

(Haidinger Fringes); Fringes of equal thickness (Fizeau Fringes). Newton's Rings: Measurement of wavelength and refractive index.

Interferometer: Michelson Interferometer-(1) Idea of form of fringes (No theory required), (2) Determination of Wavelength, (3) Wavelength Difference, (4) Refractive Index, and (5) Visibility of Fringes. Fabry-Perot interferometer.

Holography: Principle of Holography. Recording and Reconstruction Method. Theory of Holography as Interference between two Plane Waves. Point source holograms.

Reference Books

1. Waves: Berkeley Physics Course, vol. 3, Francis Crawford, 2007, Tata McGraw-Hill.
2. Fundamentals of Optics, F.A. Jenkins and H.E. White, 1981, McGraw-Hill
3. Principles of Optics, Max Born and Emil Wolf, 7th Edn., 1999, Pergamon Press.
4. Optics, Ajoy Ghatak, 2008, Tata McGraw Hill
5. The Physics of Vibrations and Waves, H. J. Pain, 2013, John Wiley and Sons.
6. The Physics of Waves and Oscillations, N.K. Bajaj, 1998, Tata McGraw Hill.
7. Fundamental of Optics, A. Kumar, H.R. Gulati and D.R. Khanna, 2011, R. Chand Publications.

BCL 201- CHEMISTRY-II

Marks (Theory) : 70

Marks (Internal Assessment) : 30

Marks(Total) : 100

Time : 3 Hrs

Note: The examiner is requested to set nine questions in all, selecting two questions from each unit and one compulsory question (Question No.1 based on entire syllabus will consist of seven short answer type questions each of two marks). The candidate is required to attempt five questions in all selecting one from each unit and the compulsory Question No.1.

UNIT-I

Chemical Bonding and Molecular Structure

15 Hrs

Introduction to Ionic Bonding: General characteristics of ionic bonding. Energy considerations in ionic bonding, lattice energy and solvation energy and their importance in the context of stability and solubility of ionic compounds. Statement of Born-Landé equation for calculation of lattice energy, polarizing power and polarizability

Introduction to Covalent bonding: Shapes of some inorganic molecules and ions on the basis of VSEPR and hybridization with suitable examples of linear, trigonal planar, square planar, tetrahedral, trigonalbipyramidal and octahedral arrangements.

Ionic Solids: Factors affecting the formation of ionic solids, concept of close packing, radius ratio rule and coordination number. Calculation of limiting radius ratio for tetrahedral and octahedral sites. Structures of some common ionic solids NaCl, ZnS (zinc blende and wurtzite).

UNIT-II

Acids and Bases

8 Hrs

Brönsted–Lowry concept, conjugate acids and bases, relative strengths of acids and bases, effects of substituent and solvent, differentiating and levelling solvents. Lewis acid-base concept, classification of Lewis acids and bases, Lux-Flood concept and solvent system concept. Hard and soft acids and bases (HSAB concept), applications of HSAB process.

Basic Coordination Chemistry 7Hrs

Coordinate Bond. Werner's coordination theory, ligands, chelates. Nomenclature of coordination compounds. Stereochemistry of different coordination numbers, isomerism. Valence-bond and crystalfield theories of bonding in complexes. Explanation of properties such as geometry colour and magnetism.

UNIT-III

Chemical Kinetics And Catalysis

15 Hrs

Rates of reactions, rate constant, order and molecularity of reactions. Differential rate law and integrated rate expressions for zero, first, second and third order reactions. Half-life time of a reaction. Methods for determining order of reaction. Effect of temperature on reaction rate and the concept of activation energy.

Catalysis: Homogeneous catalysis, Acid-base catalysis and enzyme catalysis. Heterogeneous catalysis.

UNIT-IV

Basics of spectroscopy

15 Hrs

Origin of spectra, interaction of radiation with matter, fundamental laws of spectroscopy and selection rules, validity of Beer-Lambert's law. Electromagnetic radiations, Introduction to ultraviolet, visible and infrared spectroscopy, electronic transitions, $\lambda_{\max}$ & $\epsilon_{\max}$, chromophore,

auxochrome, bathochromic, hypsochromic shifts. Infrared radiation and types of molecular vibrations, functional group and fingerprint region.

BOOKS SUGGESTED:

1. Cotton F.A. and Wilkinson G., Murillo C.A., Bochmann M., Advanced Inorg. Chemistry, 6th Edition, Pubs: John Wiley & Sons. Inc., 1999.
2. Lee J.D., Concise Inorganic Chemistry, 4th edition, Pubs: ELBS, 1991.
3. Huheey J.E., Keiter E.A., Keiter R.L., Inorganic Chemistry : Principles of Structures and Reactivity; 4th Edition, Pubs: Harper Collins, 1993.
4. Greenwood N.N. and Earnshaw A., Chemistry of the Elements, 2nd edition., Pubs: Butterworth/Heinemann, 1997.
5. Douglas B., Daniel D. Mc and Alexander J., Concepts of Models of Inorganic Chemistry, Pubs: John Wiley, 1987.
6. Puri B.R., Sharma L. R. and Pathania M. S., Principles of Physical Chemistry, Pubs: Vishal Publishing Company, 2003.
7. Laidler K. J Chemical Kinetics, McGraw Hill.
8. Castellan G.W. Physical Chemistry, Narosa Publishers
9. Kemp W. Organic Spectroscopy

BBL 201 : ELEMENTARY BIOLOGY-II (CELL BIOLOGY)

Marks (Theory) : 70

Marks (Internal Assessment) : 30

Marks(Total) : 100

Time : 3 Hrs

Note: Attempt five questions in all. The question paper will consist of **four** sections. **Question No. 1** will contain **seven** short answer type questions without any internal choice covering the entire syllabus and shall be **compulsory**. Each of the four sections (I-IV) will contain two questions and the students are required to attempt **one** question from each section. **All questions carry equal marks.**

Section – I

Cell: Introduction and classification of organisms by cell structure, cytosol, compartmentalization of eukaryotic cells, cell fractionation.

Cell Membrane and Permeability: Chemical components of biological membranes, organization and Fluid Mosaic Model, membrane as a dynamic entity, cell recognition and membrane transport.

Section – II

Membrane Vacuolar system, cytoskeleton and cell motility: Structure and function of microtubules, Microfilaments, Intermediate filaments.

Endoplasmic reticulum: Structure, function including role in protein segregation. Golgi complex: Structure, biogenesis and functions including role in protein secretion.

Section - III

Lysosomes: Vacuoles and micro bodies: Structure and functions

Ribosomes: Structures and function including role in protein synthesis.

Mitochondria: Structure and function, Genomes, biogenesis.

Chloroplasts: Structure and function, genomes, biogenesis

Nucleus: Structure and function, chromosomes and their structure.

Section – IV

Extracellular Matrix: Composition, molecules that mediate cell adhesion, membrane receptors for extra cellular matrix, macromolecules, regulation of receptor expression and function. Signal transduction.

Cancer: Carcinogenesis, agents promoting carcinogenesis, characteristics and molecular basis of cancer.

SUGGESTED READING/BOOKS

1. Karp, G. 2010. Cell and Molecular Biology: Concepts and Experiments. 6th Edition. John Wiley & Sons. Inc.
2. De Robertis, E.D.P. and De Robertis, E.M.F. 2006. Cell and Molecular Biology. 8th edition. Lippincott Williams and Wilkins, Philadelphia.
3. Cooper, G.M. and Hausman, R.E. 2009. The Cell: A Molecular Approach. 5th edition. ASM Press & Sunderland, Washington, D.C.; Sinauer Associates, MA.
4. Becker, W.M., Kleinsmith, L.J., Hardin. J. and Bertoni, G. P. 2009. The World of the Cell. 7th edition. Pearson Benjamin Cummings Publishing, San Francisco.

BXL 202 : Computer Science

Marks (Theory) : 70

Marks (Internal Assessment) : 30

Marks(Total) : 100

Time : 3 Hrs

Note: The examiner is requested to set nine questions in all, selecting two questions from each unit and one compulsory question (Question No.1 based on entire syllabus will consist of seven short answer type questions each of two marks). The candidate is required to attempt five questions in all selecting one from each unit and the compulsory Question No.1.

Unit-I

An Overview of Computer System

8Hrs

Anatomy of a digital Computer, Memory Units, Main and Auxiliary Storage Devices, Input Devices, Output Devices, Classification of Computers. Radix number system: Decimal, Binary, Octal, Hexadecimal numbers and their inter-conversions; Representation of information inside the computers.

Unit-II

Operating System Basics

7Hrs

The user Interface, Running Programmes, Managing files, Introduction to PC operating Systems: Unix/Linux, DOS, Windows 2000.

Unit-III

Internet basics

7Hrs

Introduction to the basic concepts of Networks and Data Communications, How Internet works, Major features of internet, Emails, FTP, Using the internet.

Unit-IV

Programming Languages

8Hrs

Machine-, Assembly-, High Level- Language, Assembler, Compiler, Interpreter, debuggers, Programming fundamentals: problem definition, algorithms, flow charts and their symbols, introduction to compiler, interpreter, assembler, linker and loader and their inter relationship.

BOOKS SUGGESTED:

1. Goel A., Computer Fundamentals, Pearson Education, 2010.
2. Aksoy P. & DeNardis L., Introduction to Information Technology, Cengage Learning, 2006
3. Sinha P. K. & Sinha P. Fundamentals of Computers, BPB Publishers, 2007

BPP-201: Physics Lab – II

Marks (Theory) : 70

Marks (Internal Assessment) : 30

Marks(Total) : 100

Time : 3 Hrs

(Credits: 02)

1. To determine the frequency of an electric tuning fork by Melde's experiment and verify λ^2 / T law.
2. To investigate the motion of coupled oscillators.
3. To study Lissajous Figures.
4. Familiarization with: Schuster's focusing; determination of angle of prism.
5. To determine refractive index of the Material of a prism using sodium source.
6. To determine the dispersive power and Cauchy constants of the material of a prism using mercury source.
7. To determine the wavelength of sodium source using Michelson's interferometer.
8. To determine wavelength of sodium light using Fresnel Biprism.
9. To determine wavelength of sodium light using Newton's Rings.
10. To determine the thickness of a thin paper by measuring the width of the interference fringes produced by a wedge-shaped Film.
11. To determine wavelength of (1) Na source and (2) spectral lines of Hg source using plane diffraction grating.
12. To determine dispersive power and resolving power of a plane diffraction grating.

Reference Books

1. Advanced Practical Physics for students, B.L. Flint and H.T. Worsnop, 1971, Asia Publishing House
2. A Text Book of Practical Physics, I. Prakash & Ramakrishna, 11th Ed., 2011, Kitab Mahal
3. Advanced level Physics Practicals, Michael Nelson and Jon M. Ogborn, 4th Edition, reprinted 1985, Heinemann Educational Publishers
4. A Laboratory Manual of Physics for undergraduate classes, D.P.Khandelwal, 1985, Vani Pub.

BCP 201: CHEMISTRY LAB-II

Marks (Theory) : 70

Marks (Internal Assessment) : 30

Marks(Total) : 100

Time : 3 Hrs

1. Complexometric titrations: Determination of Mg^{2+} , Zn^{2+} by EDTA.

2. Paper Chromatography: Qualitative Analysis of any one of the following Inorganic cations and anions by paper chromatography (Pb^{2+} , Cu^{2+} , Ca^{2+} , Ni^{2+} , Cl^- , Br^- , I^- and PO_4^{3-} and NO_3^-).
3. To determine the specific refractivity of at least two liquids.
4. Determine rate constant of acid catalyzed hydrolysis of methyl acetate.
5. Determination of conductance of electrolytes
6. The preliminary examination of physical and chemical characteristics (physical state, colour, odour and ignition test), extra element detection (N,S,Cl, Br and I).

BOOKS SUGGESTED:

1. Vogel A. I., Tatchell A.R., Furnis B.S., Hannaford A.J., Smith P.W.G., Vogel's Text Book of Practical Organic Chemistry, 5th Edn., Pubs: ELBS, 1989.
2. Pavia D.L., Lampman G.M., Kriz G.S. Jr., Introduction to Organic Laboratory Techniques, 3rd Edn., Pubs: Thomson Brooks/Cole, 2005.
3. Mann F.G., Saunders P.C., Practical Organic Chemistry, Pubs: Green & Co. Ltd., London, 1978.
4. Svehla, G., Vogel's Qualitative Inorganic Analysis (revised); 7th edition, Pubs: Orient Longman, 1996.
5. Bassett, J., Denney, R.C., Jeffery, G.H., Mendham, J., Vogel's Textbook of Quantitative Inorganic Analysis (revised); 4th edition, Pubs: Orient Longman, 1978.
6. Das R.C. & Behra B. Experimental Physical Chemistry, McGraw Hill.
7. Shoemaker & Gailand Experiments in Physical Chemistry, McGraw Hill.
8. Yadav J. B. Advanced Practical physical Chemistry

BXP 201: Computer Science Lab

Marks (Theory) : 70

Marks (Internal Assessment) : 30

Marks(Total) : 100

Time : 3 Hrs

C Programming language: C fundamentals, formatted input/ output, expressions, selection statements, loops and their applications; Basic types, arrays, functions, including recursive functions, program organization: local and external variables and scope; pointers & arrays

Representative programming in C

1. Write a program to find the largest of three numbers. (if-then-else)
2. Write a program to find the largest number out of ten numbers (for-statement)
3. Write a program to find the average male height & average female heights in the class (input is in form of sex code, height).
4. Write a program to find roots of quadratic equation using functions and switch statements.
5. Write a program to multiply two matrices

BOOKS SUGGESTED:

1. Kanetkar Y. Let Us C, BPB publication

Course Opted	Paper Code	Nomenclature	Credit	Hours/ Week	Max. Marks		
					External	Internal	Total
Core Course- III	BML 301	Number Theory and Trigonometry	5	5	70	30	100
Core Course -IV	BML 302	Ordinary Differential Equations	5	5	70	30	100
Core Course- V	BML 303	Advanced Calculus	5	5	70	30	100
Core Course -VI	BML 304	Vector Calculus	5	5	70	30	100
Core Course- VII	BML 305	Mathematical Statistics	5	5	70	30	100
Skill Enhancement Course- I	BML 306	Special Functions-I	2	2	36	14	50
Total Credits = 27, Total hours = 27							

Marks (Theory) : 70

Marks (Internal Assessment) : 30

Marks(Total) : 100

Time : 3 Hrs

Note: Attempt five questions in all. The question paper will consist of **four** sections. **Question No. 1** will contain **seven** short answer type questions without any internal choice covering the entire syllabus and shall be **compulsory**. Each of the four sections **(I-IV)** will contain two questions and the students are required to attempt **one** question from each section. **All questions carry equal marks.**

Section – I

Divisibility, G.C.D.(greatest common divisors), L.C.M.(least common multiple)

Primes, Fundamental Theorem of Arithmetic. Linear Congruences, Fermat's theorem. Wilson's theorem and its converse. Linear Diophantine equations in two variables

Section – II

Complete residue system and reduced residue system modulo m . Euler's ϕ function Euler's generalization of Fermat's theorem. Chinese Remainder Theorem. Quadratic residues. Legendre symbols. Lemma of Gauss; Gauss reciprocity law. Greatest integer function $[x]$. The number of divisors and the sum of divisors of a natural number n (The functions $d(n)$ and $\sigma(n)$). Moebius function and Moebius inversion formula.

Section - III

De Moivre's Theorem and its Applications. Expansion of trigonometrical functions. Direct circular and hyperbolic functions and their properties.

Section – IV

Inverse circular and hyperbolic functions and their properties. Logarithm of a complex quantity. Gregory's series. Summation of Trigonometry series.

Books Recommended :

1. S.L. Loney, Plane Trigonometry Part – II, Macmillan and Company, London.
2. R.S. Verma and K.S. Sukla, Text Book on Trigonometry, Pothishala Pvt. Ltd. Allahabad.
3. Ivan Niven and H.S. Zuckerman, An Introduction to the Theory of Numbers.

Marks (Theory) : 70

Marks (Internal Assessment) : 30

Marks(Total) : 100

Time : 3 Hrs

Note: Attempt five questions in all. The question paper will consist of **four** sections. **Question No. 1** will contain **seven** short answer type questions without any internal choice covering the entire syllabus and shall be **compulsory**. Each of the four sections **(I-IV)** will contain two questions and the students are required to attempt **one** question from each section. **All questions carry equal marks.**

Section – I

Geometrical meaning of a differential equation. Exact differential equations, integrating factors. First order higher degree equations solvable for x, y, p Lagrange's equations, Clairaut's equations. Equation reducible to Clairaut's form. Singular solutions.

Section – II

Orthogonal trajectories: in Cartesian coordinates and polar coordinates. Self orthogonal family of curves. Linear differential equations with constant coefficients. Homogeneous linear ordinary differential equations. Equations reducible to homogeneous

Section – III

Linear differential equations of second order: Reduction to normal form. Transformation of the equation by changing the dependent variable/ the independent variable. Solution by operators of non-homogeneous linear differential equations. Reduction of order of a differential equation. Method of variations of parameters. Method of undetermined coefficients.

Section – IV

Ordinary simultaneous differential equations. Solution of simultaneous differential equations involving operators (d/dx) or (d/dt) etc. Simultaneous equation of the form $dx/P = dy/Q = dz/R$. Total differential equations. Condition for $Pdx + Qdy + Rdz = 0$ to be exact. General method of solving $Pdx + Qdy + Rdz = 0$ by taking one variable constant. Method of auxiliary equations.

Books Recommended :

1. D.A. Murray, Introductory Course in Differential Equations. Orient Longman (India). 1967
2. A.R.Forsyth, A Treatise on Differential Equations, Macmillan and Co. Ltd., London
3. E.A. Coddington, Introduction to Differential Equations.
4. S.L.Ross, Differential Equations, John Wiley & Sons
5. B.Rai & D.P. Chaudhary, Ordinary Differential Equations, Narosa Publishing House Pvt. Ltd.

BML 303: Advanced Calculus**Marks (Theory) : 70****Marks (Internal Assessment) : 30****Marks(Total) : 100****Time : 3 Hrs**

Note: Attempt five questions in all. The question paper will consist of **four** sections. **Question No. 1** will contain **seven** short answer type questions without any internal choice covering the entire syllabus and shall be **compulsory**. Each of the four sections (I-IV) will contain two questions and the students are required to attempt **one** question from each section. **All questions carry equal marks.**

Section – I

Continuity, Sequential Continuity, properties of continuous functions, Uniform continuity, chain rule of differentiability. Mean value theorems; Rolle's Theorem and Lagrange's mean value theorem and their geometrical interpretations. Taylor's Theorem with various forms of remainders, Darboux intermediate value theorem for derivatives, Indeterminate forms.

Section – II

Limit and continuity of real valued functions of two variables. Partial differentiation. Total Differentials; Composite functions & implicit functions. Change of variables. Homogenous functions & Euler's theorem on homogeneous functions. Taylor's theorem for functions of two variables.

Section – III

Differentiability of real valued functions of two variables. Schwarz and Young's theorems. Implicit function theorem. Maxima, Minima and saddle points of two variables. Lagrange's method of multipliers.

Section – IV

Curves: Tangents, Principal normals, Binormals, Serret-Frenet formulae. Locus of the centre of curvature, Spherical curvature, Locus of centre of Spherical curvature, Involutives, evolutes, Bertrand Curves. Surfaces: Tangent planes, one parameter family of surfaces, Envelopes.

Books Recommended:

1. C.E. Weatherburn , Differential Geometry of three dimensions, Radhe Publishing House, Calcutta
2. Gabriel Klaumber, Mathematical analysis, Marcel Dekkar, Inc., New York, 1975
3. R.R. Goldberg , Real Analysis, Oxford & I.B.H. Publishing Co., New Delhi, 1970
4. Gorakh Prasad, Differential Calculus, Pothishala Pvt. Ltd., Allahabad
5. S.C. Malik , Mathematical Analysis, Wiley Eastern Ltd., Allahabad.
6. Shanti Narayan, A Course in Mathemtical Analysis, S.Chand and company, New Delhi
7. Murray, R. Spiegel, Theory and Problems of Advanced Calculus, Schaum Publishing co., New York

BML 304: Vector Calculus

Marks (Theory) : 70

Marks (Internal Assessment) : 30

Marks(Total) : 100

Time : 3 Hrs

Note: Attempt five questions in all. The question paper will consist of **four** sections. **Question No. 1** will contain **seven** short answer type questions without any internal choice covering the entire syllabus and shall be **compulsory**. Each of the four sections (I-IV) will contain two questions and the students are required to attempt **one** question from each section. **All questions carry equal marks.**

Section – I

Scalar and vector product of three vectors, product of four vectors. Reciprocal vectors. Vector differentiation. Scalar Valued point functions, vector valued point functions, derivative along a curve, directional derivatives

Section – II

Gradient of a scalar point function, geometrical interpretation of grad Φ , character of gradient as a point function. Divergence and curl of vector point function, characters of Div $\vec{f}$ and Curl $\vec{f}$ as point function, examples. Gradient, divergence and curl of sums and product and their related vector identities. Laplacian operator.

Section – III

Orthogonal curvilinear coordinates Conditions for orthogonality fundamental triad of mutually orthogonal unit vectors. Gradient, Divergence, Curl and Laplacian operators in terms of orthogonal curvilinear coordinates, Cylindrical co-ordinates and Spherical co-ordinates.

Section – IV

Vector integration; Line integral, Surface integral, Volume integral. Theorems of Gauss, Green & Stokes and problems based on these theorems.

Books Recommended:

1. Murraray R. Spiegel, Theory and Problems of Advanced Calculus, Schaum Publishing Company, New York.
2. Murraray R. Spiegel, Vector Analysis, Schaum Publishing Company, New York.
3. N. Saran and S.N. Nigam, Introduction to Vector Analysis, Pothishala Pvt. Ltd., Allahabad.
4. Shanti Narayna, A Text Book of Vector Calculus. S. Chand & Co., New Delhi.

Marks (Theory): 70
Marks (Internal Assessment) : 30

Marks (Total) : 100
Time : 3 Hrs

Note: Attempt five questions in all. The question paper will consist of **four** sections. **Question No. 1** will contain **seven** short answer type questions without any internal choice covering the entire syllabus and shall be **compulsory**. Each of the four sections **(I-IV)** will contain two questions and the students are required to attempt **one** question from each section. **All questions carry equal marks.**

Section – I

Measures of Central Tendency and Location: Mean, median, mode, geometric mean, harmonic mean, partition values.

Measures of Dispersion: Absolute and relative measures of range, quartile deviation, mean deviation, standard deviation (σ), coefficient of variation.

Section – II

Moments, Skewness and Kurtosis: Moments about mean and about any point and derivation of their relationships, effect of change of origin and scale on moments, Sheppard's correction for moments (without derivation), Charlier's checks, Concepts of Skewness and Kurtosis.

Section –III

Basic concepts in Probability, Bayes' theorem and its applications.

Random Variable and Probability Functions: Definition and properties of random variables, discrete and continuous random variable, probability mass and density functions, distribution function.

Section – IV

Correlation for Bivariate Data: Concept and types of correlation, Scatter diagram, Karl Pearson Coefficient (r) of correlation and rank correlation coefficient.

Linear Regression: Concept of regression, principle of least squares and fitting of straight line, derivation of two lines of regression, properties of regression coefficients, standard error of estimate obtained from regression line, correlation coefficient between observed and estimated values. Angle between two lines of regression. Difference between correlation and regression.

Books Suggested:

1. A.M. Mood, F.A. Graybill and D.C. Boes, Introduction to the theory of Statistics, McGraw Hill, 1974.
2. Baisnab and M. Jas, Element of Probability and Statistics, Tata McGraw Hill.
3. S.C. Gupta and V.K. Kapoor, Fundamentals of Mathematical Statistics, Sultan Chand & Sons, 2002.
4. P.L.Meyer, Introductory Probability and Statistical Applications, Addison-Wesley Publishing Company, 1970.

Marks (Theory) : 36

Marks (Internal Assessment) : 14

Marks(Total) : 50

Time : 2 Hrs

Note: Attempt three questions in all. The question paper will consist of **two** sections. **Question No. 1** will contain **six** short answer type questions without any internal choice covering the entire syllabus and shall be **compulsory**. Each of the two sections **(I-II)** will contain two questions and the students are required to attempt **one** question from each section. **All questions carry equal marks.**

Section – I

Series solution of differential equations – Power series method, Definitions of Beta and Gamma functions. Bessel equation and its solution: Bessel functions and their properties- Convergence, recurrence, Relations and generating functions, Orthogonality of Bessel functions.

Section – II

Legendre and Hermite differentials equations and their solutions: Legendre and Hermite functions and their properties-Recurrence Relations and generating functions. Orthogonality of Legendre and Hermite polynomials. Rodrigues' Formula for Legendre & Hermite Polynomials, Laplace Integral Representation of Legendre polynomial.

Books Recommended:

1. Erwin Kreyszing, Advanced Engineering Mathematics, John Wiley & Sons, Inc., New York, 1999
2. A.R. Forsyth, A Treatise on Differential Equations, Macmillan and Co. Ltd.
3. I.N. Sneddon, Special Functions of Mathematical Physics & Chemistry. Oliver and Boyd: Interscience Publishers.
4. W.W. Bell, Special Functions for Scientists and Engineers.

Course Opted	Paper Code	Nomenclature	Credit	Hours/ Week	Max. Marks		
					External	Internal	Total
Core Course -VIII	BML 401	Solid Geometry	5	5	70	30	100
Core Course- IX	BML 402	Transform Techniques	5	5	70	30	100
Core Course- X	BML 403	Elementary Partial Differential Equations	5	5	70	30	100
Core Course- XI	BML 404	Statics	5	5	70	30	100
Core Course- XII	BML 405	Operations Research-I	5	5	70	30	100
Skill Enhancement Course- II	BML 406	Special Functions-II	2	2	36	14	50
Total Credits = 27, Total hours = 27.							

Marks (Theory) : 70

Marks (Internal Assessment) : 30

Marks(Total) : 100

Time : 3 Hrs

Note: Attempt five questions in all. The question paper will consist of **four** sections. **Question No. 1** will contain **seven** short answer type questions without any internal choice covering the entire syllabus and shall be **compulsory**. Each of the four sections **(I-IV)** will contain two questions and the students are required to attempt **one** question from each section. **All questions carry equal marks.**

Section – I

General equation of second degree. Tracing of conics. Tangent at any point to the conic, chord of contact, pole of line to the conic, director circle of conic. System of conics. Confocal conics. Polar equation of a conic, tangent and normal to the conic.

Section – II

Sphere: Plane section of a sphere. Sphere through a given circle. Intersection of two spheres, radical plane of two spheres. Co-axal system of spheres
Cones. Right circular cone, enveloping cone and reciprocal cone.
Cylinder: Right circular cylinder and enveloping cylinder.

Section – III

Central Conicoids: Equation of tangent plane. Director sphere. Normal to the conicoids. Polar plane of a point. Enveloping cone of a coinoid. Enveloping cylinder of a coinoid.

Section – IV

Paraboloids: Circular section, Plane sections of conicoids.
Generating lines. Confocal conicoid. Reduction of second degree equations.

Books Recommended:

1. R.J.T. Bill, Elementary Treatise on Coordinary Geometry of Three Dimensions, MacMillan India Ltd. 1994.
2. P.K. Jain and Khalil Ahmad : A Textbook of Analytical Geometry of Three Dimensions, Wiley Eastern Ltd. 1999.

Marks (Theory) : 70
Marks (Internal Assessment) : 30

Marks(Total) : 100
Time : 3 Hrs

Note: Attempt five questions in all. The question paper will consist of **four** sections. **Question No. 1** will contain **seven** short answer type questions without any internal choice covering the entire syllabus and shall be **compulsory**. Each of the four sections **(I-IV)** will contain two questions and the students are required to attempt **one** question from each section. **All questions carry equal marks.**

Section – I

Laplace Transform: – Existence theorem for Laplace transforms, Linearity of the Laplace transforms, Shifting theorems, Laplace transforms of derivatives and integrals, Differentiation and integration of Laplace transforms, Convolution theorem, Inverse Laplace transforms, convolution theorem, Inverse Laplace transforms of derivatives and integrals, solution of ordinary differential equations using Laplace transform.

Section – II

Finite Laplace transformation: Definition and Properties, shifting and scaling theorem. **Fourier transforms:** Linearity property, Shifting, Modulation, Convolution Theorem, Fourier Transform of Derivatives, Relations between Fourier transform and Laplace transform, Parseval's identity for Fourier transforms, solution of differential Equations using Fourier Transforms.

Section – III

Mellin Transform: Definition and Properties of Mellin transform, shifting and scaling properties, Mellin transform of derivatives and integral.

Z-Tranform:- Z-Tranform and inverse Z-Tranform of elementary function, shifting theorem, Convolution theorem, initial and final value theorem.

Section – IV

Hankel Transform: Basic properties of Hankel transform, Basic Operational properties, Hankel transform of derivatives and some elementary functions, Relation between Fourier and Hankel transform with application to boundary value problem and PDE.

Books Recommended:

1. Erwin Kreyszing, Advanced Engineering Mathematics, John Wiley & Sons, Inc., New York, 1999.
2. A.R. Forsyth, A Treatise on Differential Equations, Macmillan and Co. Ltd.
3. I.N. Sneddon, The use of integral transform, McGraw Hill, 1972
- 5 Murray R. Spiegel, Laplace transform, Schaum's Series.

Marks (Theory) : 70

Marks (Internal Assessment) : 30

Marks(Total) : 100

Time : 3 Hrs

Note: Attempt five questions in all. The question paper will consist of **four** sections. **Question No. 1** will contain **seven** short answer type questions without any internal choice covering the entire syllabus and shall be **compulsory**. Each of the four sections **(I-IV)** will contain two questions and the students are required to attempt **one** question from each section. **All questions carry equal marks.**

Section – I

Partial differential equations: Formation, order and degree, Linear and Non-Linear Partial differential equations of the first order: Complete solution, singular solution, General solution, Solution of Lagrange's linear equations, Charpit's general method of solution. Compatible systems of first order equations, Jacobi's method.

Section – II

Linear partial differential equations of second and higher orders, Linear and non-linear homogeneous and non-homogeneous equations with constant coefficients, Partial differential equation with variable coefficients reducible to equations with constant coefficients, their complimentary functions and particular integrals, Equations reducible to linear equations with constant coefficients.

Section – III

Classification of linear partial differential equations of second order, hyperbolic, parabolic and elliptic types, Reduction of second order linear partial differential equations to Canonical (Normal) forms and their solutions, Solution of linear hyperbolic equations, Monge's method for partial differential equations of second order.

Section – IV

Cauchy's problem for second order partial differential equations, Characteristic equations and characteristic curves of second order partial differential equation, Method of separation of variables: Solution of Laplace's equation, Wave equation (one and two dimensions), Diffusion (Heat) equation (one and two dimension) in Cartesian Co-ordinate system.

Books Recommended:

1. D.A.Murray, Introductory Course on Differential Equations, Orient Longman, (India), 1967
2. Erwin Kreyszing, Advanced Engineering Mathematics, John Wiley & Sons, Inc., New York, 1999
3. A.R. Forsyth, A Treatise on Differential Equations, Macmillan and Co. Ltd.
4. Ian N.Sneddon, Elements of Partial Differential Equations, McGraw Hill Book Company, 1988
5. Frank Ayres, Theory and Problems of Differential Equations, McGraw Hill Book Company, 1972
6. J.N. Sharma and Kehar Singh, Partial Differential Equations

BML 404: Statics**Marks (Theory) : 70****Marks (Internal Assessment) : 30****Marks(Total) : 100****Time : 3 Hrs**

Note: Attempt five questions in all. The question paper will consist of **four** sections. **Question No. 1** will contain **seven** short answer type questions without any internal choice covering the entire syllabus and shall be **compulsory**. Each of the four sections **(I-IV)** will contain two questions and the students are required to attempt **one** question from each section. **All questions carry equal marks.**

Section – I

Composition and resolution of forces. Parallel forces. Moments and Couples.

Section – II

Analytical conditions of equilibrium of coplanar forces. Friction. Centre of Gravity.

Section – III

Virtual work. Forces in three dimensions. Poinso's central axis.

Section – IV

Wrenches. Null lines and planes. Stable and unstable equilibrium.

Books Recommended:

1. S.L. Loney, Statics, Macmillan Company, London
2. R.S. Verma, A Text Book on Statics, Pothishala Pvt. Ltd., Allahabad

BML 405: Operations Research-I

Marks (Theory) : 70

Marks(Total) : 100

Marks (Internal Assessment) : 30

Time : 3 Hrs

Note: Attempt five questions in all. The question paper will consist of **four** sections. **Question No. 1** will contain **seven** short answer type questions without any internal choice covering the entire syllabus and shall be **compulsory**. Each of the four sections **(I-IV)** will contain two questions and the students are required to attempt **one** question from each section. **All questions carry equal marks.**

Section- I

Definition, scope, methodology and applications of OR. Types of OR models.

Concept of optimization, Linear Programming: Introduction, Formulation of a Linear Programming Problem (LPP), Requirements for an LPP, Advantages and limitations of LP. Graphical solution: Multiple, unbounded and infeasible solutions.

Section-II

Principle of simplex method: standard form, basic solution, basic feasible solution.

Computational Aspect of Simplex Method: Cases of unique feasible solution, no feasible solution, multiple solution and unbounded solution and degeneracy. Two Phase and Big- M methods.

Section-III

Duality in LPP, primal-dual relationship. Transportation Problem: Methods for finding basic feasible solution of a transportation problem, Modified distribution method for finding the optimum solution, Unbalanced and degenerate transportation problems, transshipment problem, maximization in a transportation problem.

Section-IV

Assignment Problem: Solution by Hungarian method, Unbalanced assignment problem, maximization in an assignment problem, Crew assignment and Travelling salesman problem.

Game Theory: Two person zero sum game, Game with saddle points, the rule of dominance; Algebraic, graphical and linear programming methods for solving mixed strategy games.

Books Recommended

1. J.K. Sharma, Mathematical Model in Operations Research, Tata McGraw Hill.
2. H.A. Taha, Operations Research – An Introduction.
3. Kanti Swarup, P.K. Gupta, and Manmohan, Operations Research.
4. P.K. Gupta and D.S. Hira, Operations Research, S. Chand & Co.
5. S.I. Gass, Linear Programming (3rd Edition), McGraw Hill, New York, 1985.
6. S.D. Sharma, Operations Research.
7. N.S. Kambo, Mathematical Programming.
8. G. Hadley, Linear Programming, Narosa Publishing House, 1987.

BML-406: Special Functions-II

Marks (Theory) : 36

Marks (Internal Assessment) : 14

Marks(Total) : 50

Time : 2 Hrs

Note: Attempt three questions in all. The question paper will consist of **two** sections. **Question No. 1** will contain **six** short answer type questions without any internal choice covering the entire syllabus and shall be **compulsory**. Each of the two sections **(I-II)** will contain two questions and the students are required to attempt **one** question from each section. **All questions carry equal marks.**

Section-I

Laguerre Polynomials: Laguerre's equation and its solution, generating function, alternative expression for the Laguerre polynomials, explicit expressions and special values of the Laguerre polynomials, orthogonality properties of Laguerre polynomials, relation between Laguerre polynomials and their derivatives, recurrence relations, associated Laguerre polynomials, properties of the associated Laguerre polynomials.

Section-II

Hypergeometric functions: The hypergeometric series, an integral formula for the hypergeometric series, the hypergeometric equation, linear relation between the solutions of the hypergeometric equation, relation of contiguity, the confluent hypergeometric function, generalized hypergeometric series.

Books Recommended:

1. W.W. Bell, Special Functions for Scientists and Engineers, D. Van Nostrand Company Ltd., London 1968
2. I.N. Sneddon, Special Functions of Mathematical Physics and Chemistry, Interscience Publishers, Inc., New York, 1961.

Course Opted	Paper Code	Nomenclature	Credit	Hours /Week	Max. Marks		
					External	Internal	Total
Core Course- XIII	BML 501	Real Analysis	5	5	70	30	100
Core Course- XIV	BML 502	Groups and Rings	5	5	70	30	100
Core Course- XV	BML 503	Programming in C & Numerical Methods	5	5	70	30	100
Core Course Practical- XV	BMP 504	Programming in C & Numerical Methods - Lab	2	4	35	15	50
Discipline Specific Elective -I	BML 505	Sequences and Series	5	5	70	30	100
Discipline Specific Elective- II	BML 506	Operations Research-II	5	5	70	30	100
Total Credits = 27, Total hours = 29							

Marks (Theory) : 70

Marks(Total) : 100

Marks (Internal Assessment) : 30

Time : 3 Hrs

Note: Attempt five questions in all. The question paper will consist of **four** sections. **Question No. 1** will contain **seven** short answer type questions without any internal choice covering the entire syllabus and shall be **compulsory**. Each of the four sections **(I-IV)** will contain two questions and the students are required to attempt **one** question from each section. **All questions carry equal marks.**

Section – I

Riemann integral, Integrability of continuous and monotonic functions, The Fundamental theorem of integral calculus. Mean value theorems of integral calculus.

Section – II

Improper integrals and their convergence, Comparison tests, Abel's and Dirichlet's tests, Frullani's integral, Integral as a function of a parameter. Continuity, Differentiability and integrability of an integral of a function of a parameter.

Section – III

Definition and examples of metric spaces, neighborhoods, limit points, interior points, open and closed sets, closure and interior, boundary points, subspace of a metric space, equivalent metrics, Cauchy sequences, completeness, Cantor's intersection theorem, Baire's category theorem, contraction Principle

Section – IV

Continuous functions, uniform continuity, compactness for metric spaces, sequential compactness, Bolzano-Weierstrass property, total boundedness, finite intersection property, continuity in relation with compactness, connectedness, components, continuity in relation with connectedness.

Books Recommended:

1. P.K. Jain and Khalil Ahmad, Metric Spaces, 2nd Ed., Narosa, 2004
2. Babu Ram, Metric Spaces, Vinayaka Publication
3. T.M. Apostol: Mathematical Analysis, Narosa Publishing House, New Delhi, 1985
4. R.R. Goldberg, Real Analysis, Oxford & IBH publishing Co., New Delhi, 1970
5. D. Somasundaram and B. Choudhary, A First Course in Mathematical Analysis, Narosa Publishing House, New Delhi, 1997
6. Shanti Narayan, A Course of Mathematical Analysis, S. Chand & Co., New Delhi
7. E.T. Copson, Metric Spaces, Cambridge University Press, 1968.
8. G.F. Simmons, Introduction to Topology and Modern Analysis, McGraw Hill, 1963.

Marks (Theory) : 70

Marks (Internal Assessment) : 30

Marks(Total) : 100

Time : 3 Hrs

Note: Attempt five questions in all. The question paper will consist of **four** sections. **Question No. 1** will contain **seven** short answer type questions without any internal choice covering the entire syllabus and shall be **compulsory**. Each of the four sections (I-IV) will contain two questions and the students are required to attempt **one** question from each section. **All questions carry equal marks.**

Section – I

Definition of a group with example and simple properties of groups, Subgroups and Subgroup criteria, Generation of groups, cyclic groups, Cosets, Left and right cosets, Index of a sub-group Coset decomposition, Lagrange's theorem and its consequences, Normal subgroups, Quotient groups,

Section – II

Homomorphisms, isomorphisms, automorphisms and inner automorphisms of a group. Automorphisms of cyclic groups, Permutations groups. Even and odd permutations. Alternating groups, Cayley's theorem, Center of a group and derived group of a group.

Section – III

Introduction to rings, subrings, integral domains and fields, Characteristics of a ring. Ring homomorphisms, ideals (principal, prime and Maximal) and Quotient rings, Field of quotients of an integral domain.

Section – IV

Euclidean rings, Polynomial rings, Polynomials over the rational field, The Eisenstein's criterion, Polynomial rings over commutative rings, Unique factorization domain, R unique factorization domain implies so is $R[X_1, X_2, \dots, X_n]$

Books Recommended:

1. I.N. Herstein, Topics in Algebra, Wiley Eastern Ltd., New Delhi, 1975
2. P.B. Bhattacharya, S.K. Jain and S.R. Nagpal, Basic Abstract Algebra (2nd edition).
3. Vivek Sahai and Vikas Bist, Algebra, Narosa Publishing House.
4. I.S. Luther and I.B.S. Passi, Algebra, Vol.-II, Narosa Publishing House.

Marks (Theory) : 70

Marks (Internal Assessment) : 30

Marks(Total) : 100

Time : 3 Hrs

Note: Attempt five questions in all. The question paper will consist of **four** sections. **Question No. 1** will contain **seven** short answer type questions without any internal choice covering the entire syllabus and shall be **compulsory**. Each of the four sections **(I-IV)** will contain two questions and the students are required to attempt **one** question from each section. **All questions carry equal marks.**

Section – I

Programmer's model of a computer, Algorithms, Flow charts, Data types, Operators and expressions, Input / Output functions.

Section – II

Decisions control structure: Decision statements, Logical and conditional statements, Implementation of Loops, Switch Statement & Case control structures. Functions, Preprocessors and Arrays.

Section – III

Strings: Character Data Type, Standard String handling Functions, Arithmetic Operations on Characters. Structures: Definition, using Structures, use of Structures in Arrays and Arrays in Structures. Pointers: Solution of Algebraic and Transcendental equations: Bisection method, Regula-Falsi method, Secant method, Newton-Raphson's method. Newton's iterative method for finding pth root of a number.

Section – IV

Simultaneous linear algebraic equations: Gauss-elimination method, Gauss-Jordan method, Triangularization method (LU decomposition method). Crout's method, Cholesky Decomposition method. Iterative method, Jacobi's method, Gauss-Seidal's method, Relaxation method.

Books Recommended:

1. B.W. Kernighan and D.M. Ritchie, The C Programming Language, 2nd Edition
2. V. Rajaraman, Programming in C, Prentice Hall of India, 1994
3. Byron S. Gottfried, Theory and Problems of Programming with C, Tata McGraw-Hill Publishing Co. Ltd., 1998
4. Babu Ram, Numerical Methods, Pearson Publication.
5. M.K. Jain, S.R.K. Iyengar, R.K. Jain, Numerical Method, Problems and Solutions, New Age International (P) Ltd., 1996
6. M.K. Jain, S.R.K. Iyengar, R.K. Jain, Numerical Method for Scientific and Engineering Computation, New Age International (P) Ltd., 1999
7. E. Balagurusamy, Programming in ANSI C, Tata McGraw-Hill Publishing Co. Ltd.

Marks (Practical) : 35
Marks (Internal Assessment) : 15

Marks(Total) : 50

There will be a separate practical paper based on the theory paper BML 503.

Marks (Theory) : 70

Marks(Total) : 100

Marks (Internal Assessment) : 30

Time : 3 Hrs

Note: Attempt five questions in all. The question paper will consist of **four** sections. **Question No. 1** will contain **seven** short answer type questions without any internal choice covering the entire syllabus and shall be **compulsory**. Each of the four sections **(I-IV)** will contain two questions and the students are required to attempt **one** question from each section. **All questions carry equal marks.**

Section – I

Boundedness of the set of real numbers; least upper bound, greatest lower bound of a set, neighborhoods, interior points, isolated points, limit points, open sets, closed set, interior of a set, closure of a set in real numbers and their properties. Bolzano-Weierstrass theorem, Open covers, Compact sets and Heine-Borel Theorem.

Section – II

Sequence: Real Sequences and their convergence, Theorem on limits of sequence, Bounded and monotonic sequences, Cauchy's sequence, Cauchy general principle of convergence, Subsequences, Subsequential limits.

Infinite series: Convergence and divergence of Infinite Series, Comparison Tests of positive terms Infinite series, Cauchy's general principle of Convergence of series, Convergence and divergence of geometric series, Hyper Harmonic series or p-series.

Section – III

Infinite series: D-Alembert's ratio test, Raabe's test, Logarithmic test, de Morgan and Bertrand's test, Cauchy's nth root test, Gauss Test, Cauchy's integral test, Cauchy's condensation test.

Section – IV

Alternating series, Leibnitz's test, absolute and conditional convergence, Arbitrary series: Abel's lemma, Abel's test, Dirichlet's test, Insertion and removal of parenthesis, re-arrangement of terms in a series, Dirichlet's theorem, Riemann's Re-arrangement theorem, Pringsheim's theorem (statement only), Multiplication of series, Cauchy product of series, (definitions and examples only) Convergence and absolute convergence of infinite products.

Books Recommended:

1. R.R. Goldberg , Real Analysis, Oxford & I.B.H. Publishing Co., New Delhi, 1970
2. S.C. Malik, Mathematical Analysis, Wiley Eastern Ltd., Allahabad.
3. Shanti Narayan, A Course in Mathematical Analysis, S.Chand and Company, New Delhi
4. Murray, R. Spiegel, Theory and Problems of Advanced Calculus, Schaum Publishing Co., New York
5. T.M. Apostol, Mathematical Analysis, Narosa Publishing House, New Delhi, 1985
6. Earl D. Rainville, Infinite Series, The Macmillan Co., New York

Marks (Theory) : 70

Marks(Total) : 100

Marks (Internal Assessment) : 30

Time : 3 Hrs

Note: Attempt five questions in all. The question paper will consist of **four** sections. **Question No. 1** will contain **seven** short answer type questions without any internal choice covering the entire syllabus and shall be **compulsory**. Each of the four sections **(I-IV)** will contain two questions and the students are required to attempt **one** question from each section. **All questions carry equal marks.**

Section- I

Inventory Control: introduction of inventory, factors affecting inventory, Inventory models, Deterministic models: Economic order quantity model when shortages are allowed/not allowed, price discounts model, multi-item inventory models.

Section-II

Queuing Theory : Basic characteristics of queuing system, Birth-death equations, Steady state solution of Markovian queuing models with single and multiple servers with infinite capacity (M/M/1 and M/M/c), and with limited capacity (M/M/1/K and M/M/c/K).

Section-III

Sequencing problems: Processing of n jobs through 2 machines, n jobs through 3 machines, 2 jobs through m machines, n jobs through m machines.

Replacement problems: Replacement of items whose running cost increases with time, Replacement policies for the items that fail completely - Individual and the group replacement policies.

Section-IV

PERT and CPM: Introduction of PERT and CPM, Earliest and latest times, Determination of critical path and various types of floats, Probabilistic and cost considerations in project scheduling

Books Recommended:

1. J.K. Sharma, Mathematical Model in Operations Research, Tata McGraw Hill.
2. H.A. Taha, Operations Research – An Introduction.
3. Kanti Swarup, Gupta, P.K. and Manmohan. Operations Research.
4. P.K. Gupta and D.S Hira, Operations Research, S. Chand & Co.
5. S.D. Sharma, Introduction to Operations Research.

Course Opted	Paper Code	Nomenclature	Credit	Hours/ Week	Max. Marks		
					External	Internal	Total
Core Course -XVI	BML 601	Real and Complex Analysis	5	5	70	30	100
Core Course -XVII	BML 602	Linear Algebra	5	5	70	30	100
Core Course -XVIII	BML 603	Numerical Analysis	5	5	70	30	100
Core Course Practical-XVIII	BMP 604	Numerical Analysis - Lab	2	4	35	15	50
Discipline Specific Elective -III	BML 605	Dynamics	5	5	70	30	100
Discipline Specific Elective -IV	BML 606	Mathematical Modeling	5	5	70	30	100
Total Credits = 27, Total Hours = 29.							

Marks (Theory) : 70
Marks (Internal Assessment) : 30

Marks(Total) : 100
Time : 3 Hrs

Note: Attempt five questions in all. The question paper will consist of **four** sections. **Question No. 1** will contain **seven** short answer type questions without any internal choice covering the entire syllabus and shall be **compulsory**. Each of the four sections **(I-IV)** will contain two questions and the students are required to attempt **one** question from each section. **All questions carry equal marks.**

Section – I

Jacobians, Beta and Gamma functions, Double and Triple integrals, Dirichlet's integrals, change of order of integration in double integrals.

Section – II

Fourier's series: Fourier expansion of piecewise monotonic functions, Properties of Fourier Co-efficients, Dirichlet's conditions, Parseval's identity for Fourier series, Fourier series for even and odd functions, Half range series, Change of Intervals.

Section – III

Extended Complex Plane, Stereographic projection of complex numbers, continuity and differentiability of complex functions, Analytic functions, Cauchy-Riemann equations. Harmonic functions.

Section – IV

Mappings by elementary functions: Translation, rotation, Magnification and Inversion. Conformal Mappings, Mobius transformations. Fixed points, Cross ratio, Inverse Points and critical mappings.

Books Recommended:

1. T.M. Apostol, Mathematical Analysis, Narosa Publishing House, New Delhi, 1985
2. R.R. Goldberg, Real analysis, Oxford & IBH publishing Co., New Delhi, 1970
3. D. Somasundaram and B. Choudhary, A First Course in Mathematical Analysis, Narosa Publishing House, New Delhi, 1997
4. Shanti Narayan, A Course of Mathematical Analysis, S. Chand & Co., New Delhi
5. R.V. Churchill and J.W. Brown, Complex Variables and Applications, 5th Edition, McGraw-Hill, New York, 1990
6. Shanti Narayan, Theory of Functions of a Complex Variable, S. Chand & Co., New Delhi.

Marks (Theory) : 70
Marks (Internal Assessment) : 30

Marks(Total) : 100
Time : 3 Hrs

Note: Attempt five questions in all. The question paper will consist of **four** sections. **Question No. 1** will contain **seven** short answer type questions without any internal choice covering the entire syllabus and shall be **compulsory**. Each of the four sections (I-IV) will contain two questions and the students are required to attempt **one** question from each section. **All questions carry equal marks.**

Section – I

Vector spaces, subspaces, Sum and Direct sum of subspaces, Linear span, Linearly Independent and dependent subsets of a vector space. Finitely generated vector space, Existence theorem for basis of a finitely generated vector space, Finite dimensional vector spaces, Invariance of the number of elements of bases sets, Dimensions, Quotient space and its dimension.

Section – II

Homomorphism and isomorphism of vector spaces, Linear transformations and linear forms on vector spaces, Vector space of all the linear transformations Dual Spaces, Bidual spaces, annihilator of subspaces of finite dimensional vector spaces, Null Space, Range space of a linear transformation, Rank and Nullity Theorem,

Section – III

Algebra of Linear Transformation, Minimal Polynomial of a linear transformation, Singular and non-singular linear transformations, Matrix of a linear Transformation, Change of basis, Eigen values and Eigen vectors of linear transformations.

Section – IV

Inner product spaces, Cauchy-Schwarz inequality, Orthogonal vectors, Orthogonal complements, Orthogonal sets and Basis, Bessel's inequality for finite dimensional vector spaces, Gram-Schmidt, Orthogonalization process, Adjoint of a linear transformation and its properties, Unitary linear transformations.

Books Recommended:

1. I.N. Herstein, : Topics in Algebra, Wiley Eastern Ltd., New Delhi, 1975
2. P.B. Bhattacharya, S.K. Jain and S.R. Nagpal, Basic Abstract Algebra (2nd edition).
3. Vivek Sahai and Vikas Bist, Algebra, Narosa Publishing House.
4. I.S. Luther and I.B.S. Passi, Algebra, Vol.-II, Narosa Publishing House.

Marks (Theory) : 70

Marks (Internal Assessment) : 30

Marks(Total) : 100

Time : 3 Hrs

Note: Attempt five questions in all. The question paper will consist of **four** sections. **Question No. 1** will contain **seven** short answer type questions without any internal choice covering the entire syllabus and shall be **compulsory**. Each of the four sections **(I-IV)** will contain two questions and the students are required to attempt **one** question from each section. **All questions carry equal marks.**

Section – I

Finite Differences operators and their relations. Finding the missing terms and effect of error in a difference tabular values, Interpolation with equal intervals: Newton's forward and Newton's backward interpolation formulae. Interpolation with unequal intervals: Newton's divided difference, Lagrange's Interpolation formulae.

Section – II

Central Differences: Gauss forward and Gauss's backward interpolation formulae, Sterling, Bessel Formula. Eigen Value Problems: Power method, Jacobi's method, Given's method, House-Holder's method, QR method, Lanczos method.

Section – III

Numerical Differentiation: Derivative of a function using interpolation formulae as studied in Sections –I & II. Numerical Integration: Newton-Cote's Quadrature formula, Trapezoidal rule, Simpson's one- third and three-eighth rule, Gauss Quadrature formula.

Section – IV

Difference equation: Formation of difference equation, Linear difference equation, Difference equation reducible to linear form. Numerical solution of ordinary differential equations: Single step methods-Picard's method. Taylor's series method, Euler's method, Runge-Kutta Methods. Multiple step methods; Predictor-corrector method, Modified Euler's method, Milne-Simpson's method.

Books Recommended:

1. Babu Ram, Numerical Methods: Pearson Publication.
2. R.S. Gupta, Elements of Numerical Analysis, Macmillan's India 2010.
3. M. K. Jain, S.R.K. Iyengar and R.K. Jain, Numerical Method, Problems and Solutions, New Age International (P) Ltd., 1996
4. M. K. Jain, S.R.K. Iyengar and R.K. Jain, Numerical Method for Scientific and Engineering Computation, New Age International (P) Ltd., 1999
5. C. E. Froberg, Introduction to Numerical Analysis (2nd Edition).
6. Melvin J. Maaron, Numerical Analysis-A Practical Approach, Macmillan Publishing Co., Inc., New York
7. R.Y. Rubnistein, Simulation and the Monte Carlo Methods, John Wiley, 1981

Marks (Practical) : 35

Marks(Total) : 50

Marks (Internal Assessment) : 15

There will be a separate practical paper consisting of implementation of numerical methods in C Programming Language, studied in the theory paper BML 603.

Marks (Theory) : 70

Marks (Internal Assessment) : 30

Marks(Total) : 100

Time : 3 Hrs

Note: Attempt five questions in all. The question paper will consist of **four** sections. **Question No. 1** will contain **seven** short answer type questions without any internal choice covering the entire syllabus and shall be **compulsory**. Each of the four sections **(I-IV)** will contain two questions and the students are required to attempt **one** question from each section. **All questions carry equal marks.**

Section – I

Velocity and acceleration along radial, transverse, tangential and normal directions. Relative velocity and acceleration. Simple harmonic motion. Elastic strings.

Section – II

Mass, Momentum and Force. Newton's laws of motion. Work, Power and Energy. Definitions of Conservative forces and Impulsive forces.

Section – III

Motion on smooth and rough plane curves. Projectile motion of a particle in a plane. Vector angular velocity.

Section – IV

General motion of a rigid body. Central Orbits, Kepler laws of motion. Motion of a particle in three dimensions. Acceleration in terms of different co-ordinate systems.

Books Recommended:

1. S.L. Loney, An Elementary Treatise on the Dynamics of a Particle and a Rigid Bodies, Cambridge University Press, 1956
2. F. Chorlton, Dynamics, CBS Publishers, New Delhi
3. A.S. Ramsey, Dynamics Part-1&2, CBS Publisher & Distributors.

Marks (Theory) : 70

Marks (Internal Assessment) : 30

Marks(Total) : 100

Time : 3 Hrs

Note: Attempt five questions in all. The question paper will consist of **four** sections. **Question No. 1** will contain **seven** short answer type questions without any internal choice covering the entire syllabus and shall be **compulsory**. Each of the four sections **(I-IV)** will contain two questions and the students are required to attempt **one** question from each section. **All questions carry equal marks.**

Section – I

The process of Applied Mathematics: Mathematical modeling, need, techniques, classification and illustrative.

Section – II

Mathematical modeling through ordinary differential equation of first order. Mathematical modeling in population dynamics, mathematical modeling of epidemic and compartment models through system of ordinary differential equations.

Section – III

Mathematical modeling in economics, in medicine, Arms race, Battle, international trade and dynamics through ordinary differential equations. Mathematical modeling through ordinary differential equation of record order.

Section – IV

Mathematical modeling through difference equations: need, basic theory, economics and finance, population dynamics and Genetics, probability theory and examples.

Books Recommended:

1. J.N. Kapur: Mathematical modeling, Wiley Eastern limited, 1990.
2. J.N. Kapur, Mathematical Models in Biology and Medicine, Affiliated East-West Press (P) Ltd.
3. D.N. Burghes and A.D. Wood, Mathematical Models in the Social, Management and Life Science, John Wiley & Sons.
4. J.G. Andrews & R.R. Mclone, Mathematical Modeling, Butterworths (Pub.) Inc.