

KANNUR UNIVERSITY
PROGRAMME OUTCOMES (PO)

PO 1. Critical Thinking:

- 1.1. Acquire the ability to apply the basic tenets of logic and science to thoughts, actions and interventions.
- 1.2. Develop the ability to chart out a progressive direction for actions and interventions by learning to recognize the presence of hegemonic ideology within certain dominant notions.
- 1.3. Develop self-critical abilities and also the ability to view positions, problems and social issues from plural perspectives.

PO 2. Effective Citizenship:

- 2.1. Learn to participate in nation building by adhering to the principles of sovereignty of the nation, socialism, secularism, democracy and the values that guide a republic.
- 2.2. Develop and practice gender sensitive attitudes, environmental awareness, empathetic social awareness about various kinds of marginalization and the ability to understand and resist various kinds of discriminations.
- 2.3. Internalise certain highlights of the nation's and region's history. Especially of the freedom movement, the renaissance within native societies and the project of modernisation of the post-colonial society.

PO 3. Effective Communication:

- 3.1. Acquire the ability to speak, write, read and listen clearly in person and through electronic media in both English and in one Modern Indian Language
- 3.2. Learn to articulate, analyse, synthesise, and evaluate ideas and situations in a well-informed manner.
- 3.3. Generate hypotheses and articulate assent or dissent by employing both reasons and creative thinking.

PO 4. Interdisciplinarity:

- 4.1. Perceive knowledge as an organic, comprehensive, interrelated and integrated faculty of the human mind.
- 4.2. Understand the issues of environmental contexts and sustainable development as a basic interdisciplinary concern of all disciplines.
- 4.3. Develop aesthetic, social, humanistic and artistic sensibilities for problem solving and evolving a comprehensive perspective.

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ANNEXURE (ii)
KANNUR UNIVERSITY
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Mary Matha Arts & Science College, Mananthavady

Department of Mathematics

The mission of the Mathematics program is to provide high quality education in pure and applied mathematics in order to prepare students for graduate studies, research or professional careers in mathematical sciences and related fields.

Programme outcome

- ❖ Have the skills needed to pursue careers in education, business, and/or industry.
- ❖ Be prepared for continued study of mathematics or statistics at the post graduate level and more.
- ❖ Experience Mathematics outside of regular course work.
- ❖ Communicate Mathematics effectively
- ❖ Demonstrate a computational ability in solving a wide array of mathematical problem
- ❖ Differentiate between valid and invalid mathematical reasoning
- ❖ Develop mathematical ideas from basic axioms.
- ❖ Utilize Mathematics to solve theoretical and applied problems.
- ❖ Identify applications of Mathematics in other disciplines and in society.

Programme specific outcome MSc

A graduate with a Master's degree in Mathematics has knowledge of advanced models and methods of mathematics, including some from the research frontier of the field, and expert knowledge of a well-defined field of study, based on the highest international level of research in mathematics. The graduate has specific skills in independently comprehending, analyzing, modeling, and solving given problems at a high level of abstraction based on logical and structured reasoning.

COURSE OUTCOME

FIRST SEMESTER

MAT1C01 Basic Abstract Algebra

Upon successful completion of this course, a student will be able to:

- Describe Direct Products and finitely generated Abelian Groups, Group Action on a Set and Applications of Sylow Theorems.
- Describe Field of Quotients of the Integral Domain, Isomorphism Theorems, Series of Groups, Free Abelian Groups, Field of Quotients of the Integral

KANNUR UNIVERSITY
PROGRAMME SPECIFIC OUTCOME OF B.COM DEGREE

After the successful completion of the B.Com Degree Programme, the students shall be able to;

PSO 1:

Understand the concepts and techniques of commerce and its application in business environment

PSO 2:

Conceive the ideas on entrepreneurship and develop the skills for setting up and management of business organizations

PSO 3:

Develop the skills and abilities to become competent and competitive in the business world

PSO 4:

Develop the competency to take wise decisions at personal and professional level

PSO 5:

Appraise the impact of other disciplines on the working of business

Kannur University ✓
Programme Specific Outcome of BSc Statistics

PSO 1: To cultivate statistical thinking among students by acquainting them with various statistical methods and its applications.

PSO 2: Be able to construct statistical models of real world problems and obtain their solutions.

PSO 3: To acquire a good knowledge in decision making and inferences.

PSO 4: To familiarize with statistical software packages and can serve as a data analyst in the public or private sector.

KANNUR UNIVERSITY

PROGRAMME SPECIFIC OUTCOMES OF B.SC. MATHEMATICS PROGRAMME

PSO 1: Understand the basic concepts and tools of Mathematical logic, Set theory, Number theory, Geometry, Calculus, Algebra, Abstract structures, Linear Algebra, Analysis, Laplace transforms, Fourier series, Graph theory, and Optimization and methods of proofs.

PSO 2: Model real world problems into Mathematical problems and find solutions and understand the application of Mathematics in other Sciences and Engineering.

Programme Specification

PSO1	Understand the concepts of Computer Science and Applications.
PSO2	Understand the concepts of System Software and Application Software.
PSO3	Understand the concepts of Algorithms and Programming.
PSO4	Understand the concepts of Computer Networks and Operating Systems
PSO5	Design, develop, implement and test software systems to meet the given specifications, following the principles of Software Engineering.

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Literature

PSO 1. Understand the historical contexts behind the origin and development of English literature with a special focus on various movements and the important works belonging to such movements.

PSO 2. Understand the current methodological issues in the study of literature and apply various reading strategies employed to selected literary as well as cultural texts.

PSO 3. Understand and apply the extended meaning of “English Literature” to various post-colonial and other writings in English.

PSO 4. Understand the basics of disciplines like Film Studies, Culture Studies, Fine Arts, Women’s Writing, Dalit Writings, Post-colonial writing, Indian writing in English, Malayalam Literature and Literatures in Translation.

PSO 5. Understand and appreciate the interdisciplinary links that literary studies have with disciplines like Philosophy, History, Political Science, Sociology, Anthropology and the Sciences.

Programme Specific Outcome of BSc Zoology Programme

PSO1: Skill development for the proper identification, naming and classification of life forms especially animals.

PSO2: Acquisition of knowledge on structure, life cycle and life processes that exist among animal diversity through certain model organism studies.

PSO3: Understanding of various interactions that exist among plants animals and microbes; to develop the curiosity and love on the dynamicity of nature.

PSO4: Understanding of the major elements of variation that exist in the living world through comparative morphological and anatomical study.

PSO5: Ability to explain the diversity and evolution based on the empirical evidences in Morphology, Anatomy, Embryology, Physiology, Biochemistry, Molecular Biology and Life history.

PSO6: Skill development in the observation and study of nature, biological techniques and scientific investigation

PSO7: Making aware of the scientific and technological advancements in the fields of Information and Communication, Biotechnology and Molecular Biology for further learning and research.

PSO8: Internalisation of the concept of conservation and evolution through the channel of spirit of inquiry.

Programme Specific Outcomes (PSOs)

After successful completion of three year degree program in Chemistry a student should be able to;

PSO 1 Understand the fundamental concepts, principles and processes underlying the academic field of chemistry, its different subfields (analytical, inorganic, organic and physical), and its linkages with related disciplinary areas/subjects;

PSO 2 Demonstrate procedural knowledge that creates different types of professionals in the field of chemistry and related fields such as pharmaceuticals, chemical industry, teaching, research, environmental monitoring, product quality, consumer goods industry, food products, cosmetics industry, etc.;

PSO 3 Employ critical thinking and the scientific method to design, carry out, record and analyze the results of chemical experiments and get an awareness of the impact of chemistry on the environment and the society.

PSO 4 Use chemical techniques relevant to academia and industry, generic skills and global competencies, including knowledge and skills that enable students to undertake further studies in the field of chemistry or a related field, and work in the chemical and non-chemical industry sectors.

PSO 5 Undertake hands on lab work and practical activities which develop problem solving abilities required for successful career in pharmaceuticals, chemical industry, teaching, research, environmental monitoring, product quality, consumer goods industry, food products, cosmetics industry, etc.

PSO 6 Understand safety of chemicals, transfer and measurement of chemical, preparation of solutions, and find out the green route for chemical reaction for sustainable development.

PSO 7 Create an awareness of the impact of chemistry on the environment, society, and development outside the scientific community.

Kannur University
Programme Specific Outcome of BSc Physics Programme

PSO1: Understand and apply the principles of Classical mechanics, Quantum mechanics, Thermodynamics, Nuclear physics and Electrodynamics

PSO 2: Understand and apply the principles of Solid state physics, Optics, Photonics and Spectroscopy

PSO 3: Understand the principles of Electronics, Design and test electronic circuits

PSO 4: Understand and apply the principles of Mathematical Physics and Computational Physics and do Error analysis in measurements

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MARY MATHA ARTS & SCIENCE COLLEGE
DEPARTMENT OF ENGLISH
COURSE OUTCOME

CORE COURSE I: ESSENTIAL GRAMMAR FOR FUNCTIONAL ENGLISH
(1B01FNG)

- CO1: Understand the function of grammatical items used in spoken / written language
- CO2: Understand language rules, structure and usage.
- CO3: Understand the relationship between the form and function of grammatical categories
- CO4: Acquire the linguistic and communicative competence required in various social, academic & employment situations.

CORE COURSE II: APPLIED PHONETICS (2B02FNG)

- CO1: Understand the functioning of the English sound system
- CO2: Develop the ability to adjust their ways of articulation to suit the sound system of English and overcome the influence of the native language on their English pronunciation.
- CO3: Understand the differences in pronunciation between different varieties of English
- CO4: Improve listening skills for better understanding and production of speech sounds
- CO5: Develop a neutral accent to speak English with national and international intelligibility
- CO6: Know the basics of oral communication and develop pronunciation for performing some of the most common communicative functions.
- CO7: Understand the telephone as a mode of communication and to prepare them to handle telephone calls.

CORE COURSE III: INTRODUCTION TO ENGLISH LITERATURE I (3B03FNG)

- CO1: Develop an understanding of the English literary history till the Neo Classical Age.
- CO2: Understand the key terms and movements associated with English literature.
- CO3: Acquire a basic idea about the various genres and sub-genres in Literature.
- CO4: Acquire an in-depth understanding of a few of the major works written by the writers till the Neo-classical age.

CORE COURSE IV: WRITING SKILLS (3B04FNG)

- CO1: Understand and effectively apply the steps in the writing process.
- CO2: Construct unified, coherent and adequately developed paragraphs
- CO3: Identify various writing styles
- CO4: Apply various techniques of writing
- CO5: Learn to edit and proofread

CORE COURSE V: INTRODUCTION TO ENGLISH LITERATURE II (4B05FNG)

- CO1: Develop an understanding of English literary history from the Romantic Age to the Contemporary Age
- CO2: Understand the key terms associated with English literature.
- CO3: Understand the major movements, periods and writers.
- CO4: Acquire an in-depth understanding of a few of the major works written from the romantic Age till the Contemporary Age.

CORE COURSE VI: ORAL COMMUNICATION PRACTICE (4B06FNG)

- CO1: Develop confidence to respond in English in situations where English is important
- CO2: Develop listening and comprehension skills in the English language.
- CO3: Acquire speech skills necessary for confident and intelligent participation in Group Discussions and extempore speeches
- CO4: Learn skills related to teamwork and take up team leader roles in society as well as in future workplaces.

CORE COURSE VII: INTRODUCTION TO LINGUISTICS (5B07FNG)

- CO1: Develop an awareness of the structural organization of language and different levels of expression
- CO2: Understand the basic concepts of Linguistics and the relationship between the structure and functions of language items
- CO3: Understand the various levels of linguistic analysis (Phonology, Morphology, Syntax and Semantics)
- CO4: Acquire a historical perspective of the development of language
- CO5: Apply linguistics to different areas of activities like discourse analysis, media, ELT, NLP and literary criticism etc.

CORE COURSE VIII: INTRODUCTION TO LITERARY THEORY AND CRITICISM (5B08FNG)

- CO1: Evaluate literary subjects from divergent critical stances, of both traditional and advanced thinkers and theorists to get a view of the stages of evolution in the field of criticism.
- CO2: Understand the historical, socio-cultural, psychological and philosophical concerns that infuse critical thought and to broaden their academic view of the subject.
- CO3: Acquire foundational analytic knowledge and skills for handling literary works.
- CO4: Understand the connections between literature and theory have with the human condition, thereby affirming their impact on students as social beings.

CORE COURSE IX: -INDIAN WRITING IN ENGLISH (5B09FNG)

- CO1: Trace the development of Indian Writing in English
- CO2: Explain the Indianness in Indian Literature
- CO3: Read and appreciate Indian Literature
- CO4: Analyze the strengths and constraints of Indian English as a literary medium

CORE COURSE X: INTRODUCTION TO THEATRE STUDIES

- CO1: Develop knowledge of theatre history and dramatic literature
- CO2: Acquire the ability of appreciation and aesthetic sense for theatre arts and different genres of drama
- CO3: Analyze, interpret and evaluate dramatic literature and theatrical productions
- CO4: Understand the terms connected to theatre/drama

CORE COURSE XI: METHODOLOGY OF LANGUAGE AND LITERATURE
(5B11FNG)

CO1: Develop the ability to distinguish between humanities and other fields of study and understand the specific nature and purpose of studies in humanities.

CO2: Learn the nature and functions of language in human understanding, literature and culture.

CO3: Comprehend the role of literature in representing human reality, and understand the processes of cultural formation and cultural practices.

CO4: Acquire the taste, knowledge and skills for finding research problems and solutions, and learn the craft of academic writing and research.

CORE COURSE XII: INTRODUCTION TO MEDIA STUDIES (6B12FNG)

CO1: Analyze and evaluate media content critically

CO2: Understand the dialectical/dialogical relationship between society and media

CO3: Understand media functions and operations in the socio-historical contexts

CO4: Acquire skills related to mass-media, social media, advertising and communication.

CORE COURSE XIII: TRANSLATION STUDIES (6B13FNG)

CO1: Understand the basic theories and functions of translation

CO2: Develop skills in translating literary and non-literary texts with a special focus on the functional aspects of translation

CO3: Understand translation skills to render texts from Malayalam/Hindi into English and vice versa

CO4: Analyze different approaches to translation and grasp its importance in the literary field

CORE COURSE XIV: ENGLISH LANGUAGE TEACHING (6B14FNG)

CO1: Understand the nature of language and the theories language acquisition and learning.

CO2: Develop an insight of the methods and approaches of teaching English.

CO3: Develop the skills of teaching language and literary discourses.

CO4: understand the importance and application of instructional materials and evaluation system.

CORE COURSE XV: FILM STUDIES (6B15FNG)

CO1: Appreciate film as an art form.

CO2: Understand the nature of representation on screen and how class, race ethnicity and sexuality are represented.

CO3: Analyze films and produce informed and thorough close readings of films.

CO4: Understand how film connects with history, politics, technology, psychology and performance.

CORE COURSE XVI: -PROJECT (6B16FNG)

CO1: Identify themes and ideas and document them in appropriate text formats.

CO2: Apply the knowledge and skills acquired during the course of study in organizing ideas and documenting them using accepted writing conventions.

CO3: Explore areas and subjects of choice across disciplines maintaining the inter-Disciplinary / multifocal character of Functional English.

CO4: Write a paper that conforms to accepted standards of grammar, spelling, punctuation etc., with appropriate selection of fonts and correct use of MLA style

MARY MATHA ARTS AND SCIENCE COLLEGE, MANANTHAVADY

DEPARTMENT OF COMMERCE

COURSE OUTCOME

I semester

1. 1B01 COM (Discipline Specific Core Course) MANAGEMENT CONCEPTS AND PRINCIPLES

CO1:- Understand the evolution of management thoughts, concept of management, scope and its functions.

CO2:- Familiarize with current management practices.

CO3:- Understand the importance of ethics in business.

CO4:- Acquire knowledge and capability to develop ethical practices for effective management. CO5:- Describe the emerging trends in management.

2. 1A11 COM (General Awareness Course) BUSINESS STATISTICS AND BASIC NUMERICAL SKILLS

CO 1: Define statistics and explain its importance, scope, applications and limitations

CO 2: Understand the basic knowledge of statistical techniques, which are applicable to business.

CO 3: understand basic concepts in mathematics, which are applied in the managerial decision making.

CO 4: Develop the basic mathematical skill needed for analyzing numeric problems related to business

II semester

3. 2B02 COM (DSCC) FUNCTIONAL APPLICATIONS OF MANAGEMENT

CO 1: Describe nature and scope of financial management and the elements in the management of finance

CO 2: Enumerate marketing management and its different aspects

CO 3: Explain Human Resources Management and the activities involved in it

CO 4: Understand the modern global marketing trends and its challenges

4. 2C01 COM (Complimentary Elective Course) QUANTITATIVE TECHNIQUE FOR BUSINESS DECISIONS

CO 1:- Acquaint with the basic statistical tools, which can be applied in business and economic situations.

CO 2:- Develop knowledge in quantitative techniques, which help in tackling various problems for modern business.

CO 3:- Understand and solve problems in probability, correlation and regression.

CO 4:- Understand the effect of trend and seasonal variations on business.

CO 5:- Familiarize with the testing of hypothesis.

III semester

5. 3A12 COM (GENERAL AWARENESS COURSE II) ENTREPRENEURSHIP DEVELOPMENT

CO 1: Identify the characteristics of an entrepreneur

CO 2: describe the importance of entrepreneurs in the economic development of a nation

CO 3: identify the different types of entrepreneurs

CO 4: to strengthen their skill and quality as an entrepreneur

6. 3B03 COM CORE COURSE III : ADVANCED ACCOUNTING

CO 1. Understand the theoretical and practical knowledge of the basics of accounting.

CO 2. Acquire the knowledge of accounting for royalty, Consignment and Hire Purchase

CO 3. Imbibe the accounting concepts of Inland Branch Business.

CO 4. Comprehend the procedure for determining profit and financial position from incomplete records.

7. 3C02 COM COMPLEMENTARY COURSE II: BUSINESS REGULATORY FRAMEWORK

CO 1: Understand the nature of contracts and the essential elements of a valid contract

CO 2: Explain the difference between a valid contract and a void contract

CO 3: Understand the breach of contract and remedies available for a breach of contract

CO 4: Understand various kinds of special contracts like indemnity, guarantee, bailment and agency contract

8. 3C03 COM COMPLEMENTARY COURSE III: BUSINESS ECONOMICS

CO 1: Understand the concept of economics and its use in business

CO 2: Understand the concept of demand, elasticity and demand forecasting

CO 3: Understand production function and law of production

CO 4: Understand the methods of determining price of a product

CO 5: Explain the methods of computing national income.

CO 6: Conceive the developmental issues of Indian economy and Kerala economy

9. 3B04 COM CORE COURSE IV : COMPUTER APPLICATION I – INTRODUCTION TO COMPUTERS AND NETWORKS

CO 1: Understand about computer, peripherals, software and operating system

CO 2: Understand the importance of IT in the modern world and recent development in IT

CO 3: Develop WebPages for business

IV semester

10. 4A13 COM GENERAL AWARENESS COURSE III : GENERAL INFORMATICS SKILLS

CO 1: Explain the Fundamentals of Computers the use of computers in day to day application

CO 2: Up to date and expand the basic informatics skills necessary in the emerging knowledge society

CO 3: Effectively utilize the digital knowledge resources for their studies

CO 4: State the areas where IT can be used effectively

CO 5: Perform accounting by using the appropriate accounting packages

11. 4A14 COM GENERAL AWARENESS COURSE IV : ENVIRONMENTAL STUDIES AND DISASTER MANAGEMENT

CO 1: Understand the components of environment and need for the protection of environment
CO 2: Understand the effect of pollution on environment and the ways of protecting the environment

CO 3: Explain the social issues relating to environmental pollution

CO 4: Clearly understand the various environmental hazards and the ways of managing disaster.

12. 4B05 COM CORE COURSE V : CORPORATE ACCOUNTING

CO 1: Understand the mode of presentation and understanding of financial reporting.

CO 2: Learn the accounting procedure for recording transaction relating to the issue and redemption of shares and debentures.

CO 3: Imbibe the techniques of recording transactions in respect of amalgamation, reconstruction and liquidation of companies.

CO 4: Understand the concept of IFRS and Ind AS

13. 3B04 COM CORE COURSE IV : COMPUTER APPLICATION I – INTRODUCTION TO COMPUTERS AND NETWORKS

CO 1: Understand about computer, peripherals, software and operating system

CO 2: Understand the importance of IT in the modern world and recent development in IT

CO 3: Develop WebPages for business

14. 4C04 COM COMPLEMENTARY COURSE IV: CORPORATE LAW AND BUSINESS REGULATIONS

CO 1: Understand the provisions of Companies Act 2013

CO2: Describe the procedure for the formation, registration and winding up of the company

CO 3: Explain various kinds of companies and the authorities of companies in India

CO 4: Understand the management and administration of Companies

V semester

15. 5B07 COM CORE COURSE VII: BUSINESS RESEARCH METHODOLOGY

CO 1: Understand the fundamental aspects of research in business

CO2: identify and define research problem

CO 3: formulate research plan

CO 4: understand various methods of collecting data

CO 5: prepare research report themselves

16. 5B08 COM CORE COURSE VIII : INCOME TAX LAW AND PRACTICE

CO 1 Define the basic concepts in Income tax, explain its evolution

CO 2 Determine the residence and incidence of Tax
CO 3 Understand the incomes exempt from tax of an individual
CO 4 Compute income under different heads of income

17. 5B09 COM CORE COURSE IX: COST ACCOUNTING

CO 1: Explain the nature, scope, objectives and limitations of costing
CO 2: Identify the elements of cost and describe the methods of their ascertainment and control
CO 3: Explain the various methods of costing and their suitability for different industries
CO 4: Ascertain the cost of production of products and jobs

18. 5B10 COM CORE COURSE X : BANKING PRINCIPLES AND OPERATIONS

CO 1: Explain banking and describe the different types of banks and the functions of commercial bank
CO 2: Narrate the role of RBI in the credit control, promotion and regulation of monetary system
CO 3: Describe the relationship between banker and customer and the procedure for opening and operating the account
CO 4 : Understand the modern trends and technology used in banking

19. 5B11 COM CORE COURSE XI : COMPUTER APPLICATION III – INFORMATION TECHNOLOGY FOR BUSINESS

CO 1: Understand the role of information technology in business
CO 2: acquire knowledge in E-Commerce and its application
CO 3: acquire knowledge in information systems and Enterprise Resource Planning
CO 4: manage the office activities with the help of spreadsheet software

20. 5D05 COM GENERIC ELECTIVE COURSE V: FINANCIAL SERVICES

CO 1: Explain financial system and its constituents
CO 2: identify the different financial services provided by financial institutions
CO 3: develop a basic understanding of stock broking

VI semester

6B12 COM CORE COURSE XII : FINANCIAL MARKETS AND SERVICES

CO 1: understand the financial system and its constituents
CO2: familiarize with the activities taking place in the financial markets
CO 3: Appraise the various financial services available in the financial markets
CO 4: acquire knowledge about financial derivatives and their features

6B13 COM CORE COURSE XIII : MANAGEMENT ACCOUNTING

CO 1. Understand the fundamental concepts of management accounting.
CO 2. Acquire analytical skills associated with the interpretation of accounting reports
CO 3. Apply management accounting concepts in real life situations.
CO 4. Develop judgmental skills associated with the use of accounting information in decision making.
CO 5. Understand the use of marginal costing and budgetary control to plan and control cost and profit.

6B14 COM CORE COURSE XIV: AUDITING AND CORPORATE GOVERNANCE

CO 1: understand the term auditing, its concept, principles, procedures and requirements needed for Auditing in accordance with current legal requirements and professional standards. CO 2: familiarize with the various aspects of audit consisting of interviewing, vouching, verification and valuation of assets and liabilities

CO 3: understand the appointment, rights, duties and the liabilities of an auditor

CO 4: explain the concept of Corporate Governance and its aspects

6B15 COM CORE COURSE XV: INCOME TAX AND GST

CO 1: Compute total income and determine the tax liability of an individual and partnership firm, company and cooperative society

CO 2: Describe the income tax authorities, their powers and assessment procedure

CO 3: Explain the procedure regarding deduction of tax at source, advance tax, penalties and prosecution

CO 4: Describe Goods and Service Tax, its levy and collection

6B16 COM CORE COURSE XVI : COMPUTE APPLICATION IV – ACCOUNTING PACKAGES – TALLY

CO 1: acquire knowledge in the accounting package Tally

CO 2: understand the method of creating accounts and vouchers in tally.

CO 3: able to prepare financial statements by using Tally

CO 4: Help students develop skill in preparing financial statements in Tally.

CO 5: perform treatment of GST and TDS by using Tally

6B17 COM CORE COURSE XVII: PROJECT

CO 1: understand the method of carrying out a project

CO2: undertake project work independently

KANNUR UNIVERSITY
B.Sc. CHEMISTRY PROGRAMME

COURSE OUTCOMES (CO)

CORE COURSE: I - THEORETICAL AND INORGANIC CHEMISTRY

- CO 1: Correlate the structure and behavior of atom
- CO2: Differentiate the various chemical interactions in molecules through bonding concepts
- CO3: Analyze and interpret the gradation in the properties of elements in the periodic table
- CO4: Predict the nuclear transmutations
- CO5: identify the role of radioactive materials in different applications

CORE COURSE III : ANALYTICAL AND INORGANIC CHEMISTRY – III

- CO 1: Determine the error, standard deviation and relative standard deviation of analytical data.
- CO 2: Understand statistical treatment of analytical data and the principles underlying volumetric titrations.
- CO 3: Understand basic principles behind selective precipitation of cation.
- CO 4: Summarize the characteristics of s- and p- block elements
- CO 5: Compare the various concepts of acids and bases

CORE COURSE IV: ORGANIC CHEMISTRY – I

- CO:1) Explain the types of electron displacement in organic molecules and predict the properties of molecules based on electron displacement effect
- CO:2) Distinguish aromatic , anti aromatic and nonaromatic compounds and ions and analyse the mechanistic details of aromatic electrophilic substitution
- CO:3) Classify stereo isomers, understand the property of chirality , apply CIP rules to recognize the configuration and explain the stability of conformations drawing energy profile diagram
- CO: 4) Explain the mechanism of polymerization, synthesis and application of industrially important Polymers
- CO: 5) Explain the classification and the methods of preparation of important dyes
- CO: 6) Illustrate the preparative methods and synthetic applications of important synthetic Reagents

CORE COURSE VI : ORGANIC CHEMISTRY – II

- CO :1) Describe mechanisms for substitution and elimination reactions, and predict the effect of nucleophile, leaving group, and solvent on the relative rates of SN1 versus SN2 reactions, and E1 versus E2 reactions, as well as on the relative rates of substitution versus elimination.
- CO 2) Explain Chugaev and Cope eliminations and E1CB mechanism
- CO : 3) Illustrate the preparative methods and important properties of Hydro carbons, halogen compounds , Hydroxy compounds and Carbonyl Compounds
- CO: 4) Explain the mechanism of important name reactions including rearrangements involving hydroxyl and Carbonyl functional groups

CORE COURSE VII : ANALYTICAL AND INORGANIC CHEMISTRY-II

- CO: 1 Understand the qualitative and quantitative aspects of analysis and separation techniques
- CO: 2 Explain instrumentation and working principle of different analytical techniques –TGA, DTA and radio chemical method of analysis.
- CO: 3 Familiarize with the preparation, properties and uses of some inorganic compounds like hydrides of boron, sulphur and silicon based inorganic polymers and understand their

importance

CO :4 Explain the classification of refractories.

CO :5 Know the position, electronic configuration and physical properties of noble gases and explain hybridization and geometry of different xenon compounds

CO :6 Explain various steps involved in metallurgical operations and power metallurgy and understand Corrosion, theories of Corrosion and factors affecting Corrosion

CORE COURSE VIII : INORGANIC CHEMISTRY

On successful completion of this course, students should be able to

CO:1) Understand the behavior of transition and inner transition elements and explain the separation of lanthanides by ion exchange method and lanthanide contraction

CO: 2) Understand key features of co-ordination compounds and illustrate the theories of coordination complexes, stability of complexes and explain factors affecting crystal field splitting.

CO: 3) Explain biological functions of metal ions.

CO: 4) Familiarize new elements in periodic table and Understand recent developments in Inorganic chemistry.

CORE COURSE IX : PHYSICAL CHEMISTRY I

On successful completion of this course, students should be able to

CO1) Recognize and relate the properties of ideal and real gases

CO2) Describe the properties of liquids.

CO3) Identify and distinguish the types of solutions

CO4) Explain colligative properties of dilute solution and determine the molecular weight of a solute

CO 5) Identify different crystallographic systems and various types of crystal defects

CO 6) Describe X ray diffraction to explain internal structure of solids

CORE COURSE X : PHYSICAL CHEMISTRY II

On successful completion of this course, students should be able to

CO 1) Identify the fundamental concepts of thermodynamics

CO2) Relate and Interpret the various laws of thermodynamics

CO3) Understand the concept of entropy and how the whole universe is related to it.

CO 4) Construct phase diagrams and study the equilibrium exists between various states of matter and apply principles phase diagram to separation processes and for property modification of different type of system.

CO 5) Understand basic principles of surface chemistry and its application in various fields

CO 6) Correlate the types of colloids with its properties and to explore the applications in day today life.

CORE COURSE XI : ORGANIC CHEMISTRY – III

On successful completion of this course, students should be able to

CO1 Acquaint with the classification, structures and properties of carbohydrates, explain the configuration of glucose and fructose, their inter conversion, illustrate Killiani-Fischer synthesis and Ruff degradation

CO2 Illustrate the preparative methods and the properties of different classes of organic acids, nitrogen containing compounds and heterocyclic compounds.

CO3 Classify amino acids and peptides and explain the synthesis of simple peptides by N-protection (t-butyloxycarbonyl and phthaloyl) & C-activating groups and Merrifield solid phase

- synthesis. Explain the methods of determination of primary structure of peptides
- CO4 Distinguish the components of nucleic acids and lipids and their roles in biological system and the biological importance of various natural products. Familiarise with important drugs and their therapeutic applications
- CO 5 Recognise the types and characteristics of pericyclic reaction and analyse the pericyclic reactions by FMO methods. Understand the photochemistry of carbonyl compounds
- CO 6 Understand the principles of Green Chemistry and the importance of green synthesis and recognize the impact of green chemistry on human health and the environment

CORE COURSE XV: PHYSICAL CHEMISTRY – III

On successful completion of this course, students should be able to

- CO 1) Understand the mechanism of electrical conductance, theories of electrical conductance, and conductometric titrations
- CO 2) Understand the basic principle of ionic equilibrium and its application in laboratories
- CO 3) Design different types of electro chemical cell and able to calculate its potential.
- CO 4) Familiarise with electro analytical methods
- CO 5) Acquaint with kinetics of simple, complex, enzymatic and surface reactions
- CO 6) Understand basic principles of photochemistry and its application in spectrophotometry

CORE COURSE XVI: PHYSICAL METHODS IN CHEMISTRY

On successful completion of this course, students should be able to

- CO 1 i) Explain the important principles of spectroscopy
ii) Apply spectroscopic techniques in analyzing the structure of simple organic molecules
- CO 2 Acquainting the working principles of various instruments and their functions
- CO 3 Understand the basic principles of symmetry and group theory and its applications in chemistry
- CO 4 Study the basic principles of nanochemistry and understand the various nanofabrication methods
- CO 5 Explain the important principles for quantum chemical and molecular mechanic methods of computing the geometry and energy of molecules

CORE COURSE PRACTICAL I (1B02CHE/PCH & 2B02CHE/PCH)

Volumetric Analysis

On successful completion of this course, students should be able to

- CO 1) Apply the theoretical concepts while performing experiments.
- CO 2) Acquire practical skill to estimate acid, base, oxidizing agents etc by volumetric titration method
- CO 3) Estimate the metallic ions by complexometric titration method
- CO 4) Acknowledge experimental errors and their possible sources.
- CO 5) Able to prepare inorganic complexes
- CO 6) Design, carry out, record and analyze the results of chemical experiments

(3B05CHE/PCH & 4B05CHE/PCH) Inorganic Qualitative Analysis

On successful completion of this course, students should be able to

- CO 1) Apply the theoretical concepts while performing experiments.
- CO 2) Acquire practical skill to analyse the anions and cations qualitatively present in a mixture of inorganic salts
- CO 3) Able to design, carry out, record and analyze the results of chemical experiments
- CO 4) Learns the effective usage of chemicals

5B11 CHE /PCH & 6B11 CHE/PCH : GRAVIMETRIC ANALYSIS

On successful completion of this course, students should be able to

- CO1: Make use of standardised procedures for the Gravimetric analysis
- CO2: learn the skills of Precipitation process, digestion, filtration, incineration etc.
- CO3: Acquire practical Knowledge of co-precipitation
- CO4: Handle sintered glass vessels
- CO5) Acknowledge experimental errors and their possible sources.
- CO6) Able to design, carry out, record and analyze the results of chemical experiments

5B12 CHE/PCH& 6B12 CHE/PCH : ORGANIC CHEMISTRY

On successful completion of this course, students should be able to

- CO 1) Apply the theoretical concepts while performing experiments.
- CO2) Acquire practical skill in qualitative analysis of organic compounds
- CO 3) Acquire practical skill in preparing organic compounds and in their purification by crystallisation
- CO4) Separate organic compounds in a mixture –by steam distillation, TLC and Column Chromatography
- CO5) Acquire the habit of working safely with the chemicals and handling of equipments

6B18CHE/PCH `PHYSICAL CHEMISTRY

CO 1) Acquire practical skill in physical chemistry experiments such as Cryoscopy, Transition Experiments, Phase Rule Experiments, Conductometric titrations, Potentiometric titrations, colorimetry and Chemical Kinetics

- CO2) Learn statistical approach for evaluating data
- CO3) Able to carry out and record these experiments in a skilful manner
- CO4) Acquire the habit of working safely with the chemicals and handling of equipments

CORE COURSE XVII: ENVIRONMENTAL CHEMISTRY (ELECTIVE PAPER)

On successful completion of this course, students should be able to

- CO1 Know the importance of environmental studies and methods of conservation of natural resources.
- CO2 Describe the structure and function of an ecosystem and explain the values and Conservation of bio-diversity.
- CO3 Explain the sources, environmental effects and control measures of various types of pollutions.
- CO 4: Identify the toxic chemicals in environment and understand the sources, effects and treatment of heavy metal poisoning
- CO5: Understand the methods of domestic water treatment, Sewage analysis and Sewage Treatment

GENERIC ELECTIVE COURSE (Environmental Studies)

Course Outcome

On successful completion of this course, students should be able to

- CO 1) Differentiate the environmental segments and understand the importance of environmental segments
- CO 2) Identify the types of environmental pollution and the various sources of the pollution
- CO 3) Understand the consequences of environmental pollutions
- CO 4) Explain the measures of control of environmental pollution
- CO 5) Recognize various sustainable energy sources

**CHOICE BASED CREDIT AND SEMESTER SYSTEM
(OBE-Outcome Based Education System)
(2019 ADMISSION ONWARDS)**

Name of the Program: **B.SC. COMPUTER SCIENCE CORE, COMPLEMENTARY ELECTIVE COURSE FOR B.SC. MATHEMATICS/STATISTICS PROGRAMMES AND GENERIC ELECTIVE COURSES**

S.L. No.	Core Course/ Complementary Course / Elective Course	Name Of The Course	Course Outcome
1)	CORE COURSE I	1B01CSC : INTRODUCTION TO C PROGRAMMING	CO1: Aware about basics of programming. CO2: Capable to analyze the problem and design algorithm and flowchart. CO3: Familiar the basics of high-level language - C. CO4: Able to develop efficient and error free programs in C.
2)	CORE COURSE II	2B02CSC : ADVANCED C PROGRAMMING	CO1: Familiar with advanced concepts of C program. CO2: Capable to work with user defined as well as library functions. CO3: Skilled to solve more complex problems. CO4: Able to develop C programs using structure, union, pointers and files.
3)	GENERAL AWARENESS COURSE I	3A11CSC : PROGRAMMING IN C++	CO1: Describe the Object-Oriented Paradigm CO2: Understand dynamic memory management techniques CO3: Analyze a problem and construct a C++ program that solves it CO4: Discover errors in a C++ program and describe how to fix them
4)	GENERAL AWARENESS COURSE II	3A12CSC : DATABASE MANAGEMENT	CO1: Familiar with organized data collection. CO2: Able to design data bases. CO3: Skilled to normalize the data bases. CO4: Capable to frame queries for various purposes
5)	CORE COURSE IV	3B04CSC : DATA STRUCTURES	CO1: Able to analyze the complexity of algorithm. CO2: Familiar with linear and nonlinear data structures. CO3: Acquire the ability to select appropriate data structure for a given problem. CO4: Obtain skill for systematic approach to programming.
6)	GENERAL AWARENESS COURSE III	4A13CSC : DIGITAL ELECTRONICS	CO1: Introduce the basic and important concepts of Digital Principles and Applications. CO2: Familiarize with basic building blocks of Digital systems, Digital Logic and Digital Circuits. CO3: Design simple combinational digital systems.

S.L. No.	Core Course / Complementary Course / Elective Course	Name Of The Course	Course Outcome
7)	GENERAL AWARENESS COURSE IV	4A14CSC : OPERATING SYSTEMS	<p>CO4: Familiarize different number systems, codes and data representation.</p> <p>CO1: Familiarize with basics of design of operating systems.</p> <p>CO2: Introduce basic working process of operating systems.</p> <p>CO3: To understand the importance process and scheduling.</p> <p>CO4: To understand the issues in memory management.</p>
8)	CORE COURSE V	4B05CSC : SOFTWARE ENGINEERING	<p>CO1: To understand the Software Development Life Cycle Models.</p> <p>CO2: To familiarize with Software Requirement Analysis and Specification.</p> <p>CO3: To familiarize with Classical Software Design Techniques.</p> <p>CO4: To familiarize with various Software Testing Techniques and Tools.</p>
9)	CORE COURSE VIII	5B08CSC : WEB TECHNOLOGY	<p>CO1: Understand different components in web technology and WWW.</p> <p>CO2: Learn to develop interactive Web pages.</p> <p>CO3: Present a web document with server-side scripting using PHP.</p> <p>CO4: Know the basics of AJAX.</p>
10)	CORE COURSE IX	5B09CSC : JAVA PROGRAMMING	<p>CO1: Know the overall structure and concept of logic building activity of Java programming language</p> <p>CO2. Identify the real-world things as well as the relationship between them and understand transforming them into their corresponding computer representations.</p> <p>CO3. Realize how to achieve code reusability using inheritance, interfaces and packages and expedite application development activities.</p> <p>CO4. Familiarize simple and robust way of handling multitasking and runtime error as well as such kind of abnormal situations within a program.</p> <p>CO5. Design GUI based applications and applications that can be transmitted over internet.</p>
11)	CORE COURSE X	5B10CSC : COMPUTATION USING PYTHON	<p>CO1: Learn Python for expressing computation</p> <p>CO2: Familiarize with functions and modules in python</p> <p>CO3: Understand object-oriented programming concepts</p>

Sl. No.	Core Course/ Complementary Course / Elective Course	Name Of The Course	Course Outcome
12)	CORE COURSE XI	5B11CSC-A: ALGORITHM DESIGNING	CO4: Learn the techniques for database connectivity and GUI programming in Python CO1: Capable to select suitable algorithm design technique. CO2: Able to design optimum algorithms for problems. CO3: Skilled to design solutions for real problems.
13)	CORE COURSE XI	5B11CSC-B: LINUX ADMINISTRATION	CO1: To learn basic Linux commands and understand the file system structure CO2: To understand the Boot loaders and the configuration files CO3: To learn different system services, maintenance and configuring these CO4: To experience Shell Scripting
14)	CORE COURSE XI	5B11CSC-C: COMPUTER GRAPHICS	CO1: Understand basic concepts of graphics input and display devices. CO2: Learn line and circle drawing algorithms. CO3: Familiarization with 2D and 3D transformations and projections. CO4: Understand fundamentals of image processing
15)	CORE COURSE XII	6B12CSC : DATA COMMUNICATION AND COMPUTER NETWORKING	CO1: Understand state-of-the-art in network protocols, architectures and application. CO2: To acquire knowledge about different computer networks CO3: To understand the use of layer architecture for networking systems.
16)	CORE COURSE XIII	6B13CSC : COMPILER DESIGN	CO1: Learn the basic principles of compiler. CO2: Get an idea about the related programs. CO3: Understand different components of a compiler. CO4: Understand the phases of a compiler.
17)	CORE COURSE XIV	6B14CSC : COMPUTER ORGANIZATION	CO1: Understand the basic terminology of computer system. CO2: Understand the functional units of a computer system. CO3: Understand the basic operations of a computer system. CO4: Understand the memory organization in a computer system.
18)	CORE COURSE XIV	6B15CSC-A: INFORMATION SECURITY	CO1: To understand the need of information security and to master information security Concepts, mechanisms and services as well as issues related to information Security.

S.I. No.	Core Course/ Complementary Course / Elective Course	Name Of The Course	Course Outcome
			<p>C02: To be familiar with cryptography and its categories.</p> <p>C03: Distinguish public and private key crypto systems and familiarize the rsa crypto System.</p> <p>C04: To attain the knowledge of digital signature and its security services.</p>
19)	CORE COURSE XIV	6B15CSC-B : DATA MINING	<p>C01: To Introduce the Concepts of Data Mining and its Applications.</p> <p>C02: To Understand Investigation of Data using practical Data Mining Tools.</p> <p>C03: To Introduce Association Rules Mining.</p> <p>C04: To Introduce Clustering and Classification.</p>
20)	CORE COURSE XIV	6B15CSC-C : BIOINFORMATICS	<p>C01: Understand Bioinformatics and biological databases.</p> <p>C02: Understand Concept of Biology.</p> <p>C03: Understand Sequence alignment and Similarity search tools.</p> <p>C04: Structural bioinformatics and Bioinformatic tools.</p>
21)	COMPLEMENTARY ELECTIVE COURSE I	1C01CSC : INTRODUCTION TO COMPUTERS AND PROGRAMMING	<p>C01: Familiarize with the hardware components of a digital computer</p> <p>C02: Understand the basic idea of how data is represented in computers</p> <p>C03: Familiarize with types of software</p> <p>C04: Ability to design algorithmic solutions to problems</p>
22)	COMPLEMENTARY ELECTIVE COURSE II	2C02CSC : PROGRAMMING IN C	<p>C01: Understand the building blocks of C programming language</p> <p>C02: Familiarize with program control structures in C</p> <p>C03: Learn procedural programming using functions</p> <p>C04: Understand user defined data types</p>
23)	COMPLEMENTARY ELECTIVE COURSE III	3C03CSC : WEB TECHNOLOGY WITH DATABASE MANAGEMENT SYSTEM	<p>C01: Develop skills to design a web page using HTML</p> <p>C02: Understand HTML Forms and CSS Styling</p> <p>C03: Develop skills to develop database and retrieve data using SQL</p> <p>C04: Learn basics of server-side programming with PHP</p>
24)	COMPLEMENTARY ELECTIVE COURSE IV	4C04CSC : COMPUTATION USING PYTHON	<p>C01: Learn Python for expressing computation</p> <p>C02: Familiarize with functions and modules in python</p> <p>C03: Understand object-oriented programming concepts</p>

S.L. No.	Core Course/ Complementary Course / Elective Course	Name Of The Course	Course Outcome
25)	COMPLEMENTARY ELECTIVE COURSE V:	4C05CSC : LAB 1 - PROGRAMMING IN C, WEB PROGRAMMING AND PYTHON PROGRAMMING	C04: Learn the techniques for data visualization in python C01: Achieve skills to use C language for problem solving C02: Understand SQL and basic web programming C03: Achieve skills to use Python for problem solving
26)	GENERIC ELECTIVE COURSE I	5D01CSC : PROGRAMMING IN C	C01: To understand the basic knowledge of programming C02: To develop C programs C03: To develop skill in advanced program constructs C04: To develop skill in programming
27)	GENERIC ELECTIVE COURSE II	5D02CSC : Web Technology	C01: To understand the knowledge of HTML C02: To understand the knowledge of various HTML tags C03: To enable students to program for the World Wide Web using HTML C04: To understand the basic knowledge of Java Script
28)	GENERIC ELECTIVE COURSE III	5D03CSC : DATABASE MANAGEMENT SYSTEM	C01: To understand the fundamentals of database management system C02: To develop Skill in designing database C03: To understand the concept of SQL commands C04: To develop Skill in writing queries
29)	GENERIC ELECTIVE COURSE IV	5D04CSC : FUNDAMENTALS OF COMPUTERS AND PROGRAMMING	C01: To know the working principle of a computer C02: To understand the concept of number system C03: To understand the basics of computer network C04: To understand the basics of programming
30)	GENERIC ELECTIVE COURSE IV	5D05CSC : INTRODUCTION TO PYTHON PROGRAMMING	C01: Learn Python for expressing computation C02: Learn about program control statements in python C03: Familiarize with functions and modules in python C04: Learn the techniques for data visualization in python

KANNUR UNIVERSITY
BSc MATHEMATICS PROGRAMME
COURSE OUTCOMES

CORE COURSE 1: SET THEORY, DIFFERENTIAL CALCULUS AND NUMERICAL METHODS

CO1	Understand Relations and Functions
CO2	Understand limit of a function, limit laws, continuity, Inverse functions and their derivatives
CO3	Understand successive differentiation and Leibnitz theorem
CO4	Understand functions of several variables, limit and continuity, partial derivatives, chain rule, homogenous functions and Euler's theorem on homogenous functions
CO5	Understand bisection method, Regula-falsi method and Newton-Raphson method to solve algebraic and transcendental equations

CORE COURSE 2: INTEGRAL CALCULUS AND LOGIC

CO1	Understand Hyperbolic functions
CO2	Understand Reduction formulae for trigonometric functions and evaluation of definite integrals $\int_0^{\frac{\pi}{2}} \sin^m x$, $\int_0^{\frac{\pi}{2}} \cos^m x$ and $\int_0^{\frac{\pi}{2}} \sin^p x \cos^q x$
CO3	Understand Polar coordinates
CO4	Understand Double integrals in Cartesian and polar form.
CO5	Understand triple integrals in rectangular, cylindrical and spherical coordinates
CO6	Understand Substitution in multiple integrals
CO7	Understand Numerical integration: Trapezoidal rule, Simpson's 1/3 rd rule
CO8	Understand Logic and methods of proofs
CO9	Understand Propositional functions, truth set and Negation of quantified statements

CORE COURSE 3: ANALYTIC GEOMETRY AND APPLICATIONS OF DERIVATIVES

CO1	Understand cartesian equation of conics, eccentricity, polar equations for a conic, lines, circles
CO2	Understand Tangents, Normals and Asymptotes
CO3	Understand Curvature, Radius of curvature, Centre of Curvature, Circle of curvature and Evolutes of Cartesian and polar curves,
CO 4	Understand Rolle's Theorem, Lagrange's Mean Value Theorem, Cauchy's Mean Value Theorem and Taylor's Theorem
CO5	Understand extreme values of functions, monotonic functions, first derivative test, concavity and curve sketching
CO6	Understand Indeterminate forms

CORE COURSE 4:

NUMBER THEORY AND APPLICATIONS OF INTEGRALS

COURSE OUTCOMES

CO1	Understand Division algorithm, Greatest common Divisor, Euclidean Algorithm, Diophantine equation $ax+by=c$.
CO2	Understand Primes and their distribution, fundamental theorem of arithmetic, the sieve of Eratosthenes
CO3	Understand Basic properties of congruence
CO4	Understand Picard's little theorem, Wilson's theorem and Euler's theorem
CO5	Understand Substitution and the area between curves, Arc length, Areas and length in polar co-ordinates
CO6	Understand Volumes using cross sections, volumes using cylindrical shells and areas of surfaces of revolution

CORE COURSE 5:

CORE COURSE 5:
SET THEORY, THEORY OF EQUATIONS AND
COMPLEX NUMBERS

CO1	Understand finite and infinite sets, Countable and Uncountable sets, Cantor's theorem.
CO2	Understand Roots of equations, Relations connecting the roots and coefficients of an equation, Transformation of equations, The cubic equation, Character and position of roots of an equation.
CO3	Understand Descarte's rule of signs, De Gua's Rule, Limits to the roots of an equation, Rational roots of equations, Newton's method of divisors, Symmetric functions of roots of an equation, Symmetric functions involving only the difference of the roots of $f(x)=0$, Equations whose roots are symmetric functions of α, β, γ .
CO4	Understand Reciprocal equations.
CO5	Understand Cubic equation, Equation whose roots are the squares of the difference of the roots, Character of the Roots, Cardan's Solution
CO6	Understand Roots of complex numbers, General form of De Moivre's theorem, the n^{th} roots of unity, the n^{th} roots of -1, Factors of x^n-1 and x^n+1 , the imaginary cube roots of unity.
CO7	Understand polar form of complex numbers, powers and roots.

CORE COURSE 6:

REAL ANALYSIS I

CO1	Understand Algebraic Properties, Order Properties and Absolute values of \mathbb{R} . Understand the Completeness Property of \mathbb{R} and its applications to derive Archimedean Property and Density theorem.
CO2	Understand intervals in the real line.
CO3	Understand Sequences and their Limits, Limit Theorems, Monotone Sequences.
CO4	Understand Subsequences and the Bolzano-Weierstrass Theorem, The Cauchy Criterion.
CO5	Understand Infinite Series, Absolute Convergence.
CO6	Understand Comparison test, Root test, Ratio test, Integral test and Raabe's test for Absolute convergence.
CO7	Understand Alternating series test, Dirichlet's test and Abel's test for Non Absolute convergence.
CO8	Understand Continuous Functions, composition of continuous functions and continuous functions on intervals.

CORE COURSE 7:

ABSTRACT ALGEBRA

CO1	Understand definition and elementary properties of Groups, Subgroups and Cyclic groups
CO2	Understand Groups of Permutations, orbits, Alternating groups and theorem of Lagrange
CO3	Understand group homomorphisms , factor Groups
CO4	Understand Fundamental Homomorphism Theorems
CO5	Understand definition and properties of rings and fields
CO6	Understand Ring homomorphisms and isomorphisms
CO7	Understand zero divisors , integral domains , characteristic of a ring and their properties

CORE COURSE 8: DIFFERENTIAL EQUATIONS AND LAPLACE TRANSFORMS

CO1	Understand Separable ODEs, Exact ODEs, Linear ODEs, Bernoulli equation and methods to solve these ODEs
CO2	Understand the theorem of Existence and Uniqueness of solutions of first and second order ODEs
CO3	Understand Homogeneous Linear ODEs of Second Order and solve homogeneous linear ODEs of second order with constant coefficients and Euler-Cauchy equation
CO4	Understand Nonhomogeneous ODEs and solve by variation of parameters
CO5	Understand Laplace Transform and inverse Laplace Transformation
CO6	Understand The first and The second shifting theorems and their applications
CO7	Understand the methods to find Laplace transforms of derivatives and integrals of functions
CO8	Understand the method of differentiating and integrating Laplace transform
CO9	Solve ordinary differential equations and integral equations using Laplace transform

CORE COURSE 9: VECTOR CALCULUS

CO1	Understand lines and planes in space
CO2	Understand curves in space, their tangents, normal, curvature, tangential and normal curvature of acceleration
CO3	Understand Directional derivatives and gradient vectors, tangent planes and differentials. Solve extreme value problems using Lagrange multipliers
CO4	Understand Partial derivatives with constrained variables and Taylor's formula for two variables
CO5	Understand Line integrals. Solve for work, circulation and flux using line integrals

CO6	Understand path independence conservative fields and potential functions
CO7	Understand Green's theorem and solve problems using Green's theorem
CO8	Understand Surface area and surface integrals
CO9	Understand Stoke's theorem and solve problems using Stoke's theorem
CO10	Understand Divergence theorem and solve problems using Divergence theorem

CORE COURSE 10: REAL ANALYSIS II

CO1	Understand Uniform Continuity, Monotone and Inverse Functions
CO2	Understand Riemann Integral and Riemann-integrable Functions
CO3	Understand Fundamental Theorem of Calculus
CO4	Understand Improper Integrals
CO5	Understand Beta and Gamma Functions and their properties.
CO6	Understand Transformations of Gamma Function and Duplication formula
CO7	Understand Pointwise and Uniform Convergence of sequence of functions and Interchange of Limits
CO8	Understand Series of Functions
CO9	Understand the concept of Metric Spaces

CORE COURSE 11: 6B11 MAT: COMPLEX ANALYSIS

CO1	Understand Analytic Function, Cauchy–Riemann Equations, Laplace’s Equation.
CO2	Understand Exponential Function, Trigonometric Functions, Hyperbolic Functions, Logarithmic functions and General Power of complex numbers
CO3	Understand line integral in the complex plane ,Cauchy’s integral theorem , Cauchy’s integral formula and derivatives of analytic functions
CO4	Understand convergence of Sequences and Series of complex functions
CO5	Understand power series, functions given by power series, Taylor series, Maclaurin’s Series and Laurent Series
CO6	Understand singularities and zeros of complex functions
CO7	Understand residue integration method and integrate real integrals

CORE COURSE 12:

NUMERICAL METHODS, FOURIER SERIES AND PARTIAL DIFFERENTIAL EQUATIONS

CO1	Understand Interpolation techniques: Interpolation with unevenly spaced points, Lagrange interpolation, Newton’s divided differences interpolation, Finite difference operators and finite differences, Newton’s interpolation formulae and Central difference interpolation.
CO2	Understand Numerical differentiation using difference formulae
CO3	Understand Picard’s method, Solution by Taylor series method, Euler method and Runge- Kutta methods.

CO4	Understand convergence of Sequences and Series of complex functions
CO5	Understand power series, functions given by power series, Taylor series, Maclaurin's Series and Laurent Series
CO6	Understand singularities and zeros of complex functions
CO7	Understand residue integration method and integrate real integrals

CORE COURSE 12:

NUMERICAL METHODS, FOURIER SERIES AND PARTIAL DIFFERENTIAL EQUATIONS

COURSE OUTCOMES

CO1	Understand Interpolation techniques: Interpolation with unevenly spaced points, Langrange interpolation, Newton's divided differences interpolation, Finite difference operators and finite differences, Newton's interpolation formulae and Central difference interpolation.
CO2	Understand Numerical differentiation using difference formulae
CO3	Understand Picard's method, Solution by Taylor series method, Euler method and Runge- Kutta methods.
CO4	Understand Fourier Series: Arbitrary period, Even and Odd Functions, Half-Range Expansions and Fourier Integrals.
CO5	Understand Partial Differential eqations, Solution by Separating Variables.
CO6	Understand the use of Fourier Series in solving PDE: D'Alembert's Solution of the Wave Equation. Characteristics and solving Heat Equation by Fourier Series.
CO7	Understand Laplacian in Polar Coordinates

CO4	Understand Fourier Series: Arbitrary period, Even and Odd Functions, Half-Range Expansions and Fourier Integrals.
CO5	Understand Partial Differential equations, Solution by Separating Variables.
CO6	Understand the use of Fourier Series in solving PDE: D'Alembert's Solution of the Wave Equation. Characteristics and solving Heat Equation by Fourier Series.
CO7	Understand Laplacian in Polar Coordinates

**CORE COURSE 13:
LINEAR ALGEBRA**

COURSE OUTCOMES

CO1	Understand the concept of Vector spaces, subspaces, linear combinations and system of equations.
CO2	Understand the concept of Linear Dependence and Linear Independence, Bases and Dimension, Maximal Linearly Independent Subsets and solves problems.
CO3	Understand the concept of Linear Transformations, Null Spaces, and Ranges, The Matrix Representation of a Linear Transformation.
CO4	Understand Rank of a matrix, Elementary transformations of a matrix, Invariance of rank through elementary transformations, Normal form, Elementary matrices.
CO5	Understand the concept System of linear homogeneous equations Null space and nullity of matrix, Range of a matrix, Systems of linear non homogeneous equations.
CO6	Understand Eigen values, Eigen vectors, Properties of Eigen values, Cayley-Hamilton theorem.

DISCIPLINE SPECIFIC ELECTIVE COURSE 1:

GRAPH THEORY

COURSE OUTCOMES

CO1	Understand a graph, subgraph, different types of graphs and their properties
CO2	Understand and represent graph as matrix
CO3	Understand a path, cycle, trees, bridges and their properties
CO4	Understand cut vertices and connectivity of graphs
CO5	Understand Eulerian graphs, Hamiltonian graphs, The Chinese

	Postman Problem and The Travelling Salesman Problem.
CO6	Understand planar graphs, Euler's formula, The Platonic bodies and Kuratowski's Theorem
CO7	Model real world problems using the concept of graphs
CO8	Solve real world problems using the concept of graphs

DISCIPLINE SPECIFIC ELECTIVE COURSE 2:

6B14B MAT: OPERATIONS RESEARCH

COURSE OUTCOMES

CO1	Understand convex sets, convex functions, their properties, local and global extrema and quadratic forms
CO2	Understand LPP, formulate and solve using graphical method
CO3	Understand General LPP, canonical and standard forms of LPP
CO4	Understand simplex method and solve LPP
CO5	Understand basic solution, degenerate solution, basic feasible solution, optimum basic feasible solution, fundamental properties of solution and simplex method
CO6	Understand primal-dual pair, formulation of dual and duality theorems
CO7	Understand LP formulation of transportation problem and its solution
CO8	Understand Mathematical formulation of Assignment problem and

	Hungarian Assignment method
CO9	Understand problem of sequencing, Processing 'n' jobs through '2' machines, Processing 'n' jobs through 'k' machines
CO10	Understand basic terms in Game theory, The Maximin-Minimax Principle, Solution of game with saddle point, Solution of 2x2 game without saddle point, Graphic solution of 2xn and mx2 games and Arithmetic method for nxn Games.

DISCIPLINE SPECIFIC ELECTIVE COURSE 3:

CRYPTOGRAPHY

COURSE OUTCOMES

CO1	Understand Simple Cryptosystems namely, The Shift Cipher, The Substitution Cipher, The Affine Cipher, The Vigenere Cipher, The Hill Cipher, The Permutation Cipher and Stream Ciphers
CO2	Understand basics of Shannon's Theory, Elementary Probability Theory, Perfect Secrecy, Entropy, Huffman Encodings and Entropy, Properties of Entropy, Spurious Keys and unicity Distance, Product Cryptosystems.
CO3	Understand The Euclidean Algorithm, The Chinese Remainder Theorem
CO4	Understand Legendre and Jacobi Symbols and quadratic residues
CO5	Understand The RSA System and Factoring (25 Hours): Introduction to Public-key Cryptography, The RSA Cryptosystem, Implementing RSA, Primality Testing, The Solovay-Strassen Algorithm, The Miller Rabin Algorithm, Square roots modulo n .

DISCIPLINE SPECIFIC ELECTIVE COURSE 4:

FUZZY MATHEMATICS

COURSE OUTCOMES

CO1	Understand Fuzzy Subsets, L-fuzzy Sets, Visual representation of a Fuzzy Subset, Operations on Fuzzy Subsets, Empty Fuzzy Subset 0
CO2	Understand Universal Fuzzy Subset, Disjoint Fuzzy Subsets, Disjunctive Sum
CO3	Understand α Level Set, Properties of Fuzzy Subsets of a Set, Algebraic Product and Sum of Two Fuzzy Subsets, Properties Satisfied by Addition and Product
CO4	Understand Cartesian Product of Fuzzy Subsets
CO5	Understand Fuzzy Relations, Binary Fuzzy Relations, Binary Relations on a Single Set, Fuzzy Equivalence Relations
CO6	Understand Fuzzy Subgroup, Fuzzy Subgroupoids
CO7	Understand The Lattice of Fuzzy Subgroups, Fuzzy Subgroup, Fuzzy Subrings

DISCIPLINE SPECIFIC ELECTIVE COURSE 5:

PROGRAMMING IN PYTHON

COURSE OUTCOMES

CO1	Understand the basics of Python Variables, Indentation in Python, Input, Output and Import Functions Operators
CO2	Understand Python programming for numbers, Dictionaries and Mathematical functions

CO3	Understand Flow Control, if, if..else, if ,.else, Loops – for loop, Range Function, while, Section 3.3 Nested Loop, Break and Continue Statements in Pythan
CO4	Understand Data visualization – The Matplot lib Module, Plotting mathematical functions, Famous Curves, 2D plot using colors, Mesh grids, 3D Plots using Pthan
CO5	Understand Pythan programming for Solving equations using Newton-Raphson's Method , Bisection Method , Method of false position, Trapezoidal rule of Numerical Integration , Simpson's Three Eighth rule of Numerical Integration, Euler's Modified Method to solve first order differential equation , Runge-Kutta Method of Order 4, Lagrange's Method for Interpolation.

**COURSE OUTCOME
FIRST SEMESTER
MAT1C03 Real Analysis**

Upon successful completion of this course, a student will be able to:

- Describe the real line as a complete, ordered field,
- Determine the basic topological properties of subsets of the real numbers,
- Use the definitions of convergence as they apply to sequences, series, and functions,
- Determine the continuity, differentiability, and integrability of functions defined on subsets of the real line,
- Apply the Mean Value Theorem and the Fundamental Theorem of Calculus to problems in the context of real analysis, and
- Produce rigorous proofs of results that arise in the context of real analysis.
- Determine the Riemann integrability and the Riemann-Stieltjes integrability of a bounded function and prove a selection of theorems concerning integration,
- Illustrate the effect of uniform convergence on the limit function with respect to continuity, differentiability, and integrability, and
- Illustrate the convergence properties of power series.
- Determine the continuity, differentiability, and integrability of functions defined on subsets of the real line,
- Apply the Mean Value Theorem and the Fundamental Theorem of Calculus to problems in the context of real analysis, and
- Recognize the difference between pointwise and uniform convergence of a sequence of functions,

**COURSE OUTCOME
FIRST SEMESTER
MAT1C04 Basic Topology**

Upon successful completion of this course, a student will be able to:

- Define and illustrate the concept of topological spaces and continuous functions,
- Define and illustrate the concept of product topology and quotient topology,
- Prove a selection of theorems concerning topological spaces, continuous functions, product topologies, and quotient topologies,
- Define and illustrate the concepts of the separation axioms,
- Define connectedness and compactness, and prove a selection of related theorems.

**COURSE OUTCOME
FIRST SEMESTER**

MAT1C01 Basic Abstract Algebra

Upon successful completion of this course, a student will be able to:

- Describe Direct Products and finitely generated Abelian Groups, Group Action on a Set and Applications of Sylow Theorems.
- Describe Field of Quotients of the Integral Domain, Isomorphism Theorems, Series of Groups, Free Abelian Groups, Field of Quotients of the Integral

Domain, Ring of Polynomials, Factorization of Polynomials over a Field, Homomorphisms and Factor Rings, Prime and Maximal Ideals.

- Read and write mathematical proofs and do computations related to the above topics.
- Assess properties implied by the definitions of groups and rings,
- Use the concepts of isomorphism and homomorphism for groups and rings, and
- Produce rigorous proofs of propositions arising in the context of abstract algebra.

COURSE OUTCOME

FIRST SEMESTER

MAT1C02 Linear Algebra

Upon successful completion of this course, a student will be able to:

- Solve systems of linear equations,
- Analyze vectors in \mathbb{R}^n geometrically and algebraically,
- Recognize the concepts of the terms span, linear independence, basis, dimension, linear transformations, the algebra of linear transformations, Isomorphism, Representation of transformation by matrices, linear functional, the transpose of a linear transformation. elementary canonical forms, the primary decomposition theorem, the rational and Jordan forms, Inner Product Spaces, and apply these concepts to various vector spaces and subspaces
- Analyze finite and infinite dimensional vector spaces and subspaces over a field and their properties, including the basis structure of vector spaces, Use the definition and properties of linear transformations and matrices of linear transformations and change of basis, including kernel, range and isomorphism,
- Compute with the characteristic polynomial, eigenvectors, eigenvalues and eigenspaces, as well as the geometric and the algebraic multiplicities of an eigenvalue and apply the basic diagonalization result,
- Compute inner products and determine orthogonality on vector spaces, including Gram-Schmidt orthogonalization, and
- Identify self-adjoint transformation and apply the spectral theorem and orthogonal decomposition of inner product spaces, the Jordan canonical form to solving systems of ordinary differential equations.

**COURSE OUTCOME
FIRST SEMESTER**

MAT1C05 Differential Equations

Upon successful completion of this course, a student will be able to:

- Find power series solutions of differential equations, and
- Find solution of Legendre Functions, Bessel Functions and System of first order equations
- Solve Non Linear Equations
- Describe the Existence and Uniqueness of Solutions and prove Picard's Theorem.
- Develop the ability to apply differential equations to significant applied and/or theoretical problems

**COURSE OUTCOME
SECOND SEMESTER**

MAT2C06 Advanced Abstract Algebra

Upon successful completion of this course, a student will be able to:

- Learnt basic facts, methods and ideas related to the algebraic structures of groups, rings, fields and integral domains.
- Do more specialized study in algebra
- Understand the necessity of abstraction and how it widens the scope of application especially related to number theory.
- Assess properties implied by the definitions of groups and rings,
- Familiar with Unique Factorization Domains, Euclidean Domains, Gaussian Integers and Multiplicative Norms, Introduction to Extension Fields Algebraic Extensions, Geometric Constructions, Finite Fields, Automorphisms of Fields, The Isomorphism Extension Theorem, Splitting Fields, Separable Extensions. Galois Theory
- Read and write mathematical proofs and do computations related to the above topics.
- Produce rigorous proofs of propositions arising in the context of abstract algebra.

**COURSE OUTCOME
SECOND SEMESTER**

MAT2C 07 Measure and Integration

Upon successful completion of this course, a student will be able to:

- Define and illustrate the concept of measure on the real line, Lebesgue Outer measure, Measurable sets, Regularity, Measurable Functions, Borel and Lebesgue Measurability.
- Familiar with integration of functions of a real variable and Riemann and Lebesgue Integrals.
- Illustrate the concept of extension of measure, Measure spaces, integration with respect to a measure, The LP Spaces, The inequalities of Holder and Minkowski and completeness of LP (μ)
- Do more specialized study in measure and integration.

**COURSE OUTCOME
SECOND SEMESTER
MAT2C08 Topology**

Upon successful completion of this course, a student will be able to:

- Define and illustrate the concept of topological spaces and continuous functions,
- Define and illustrate the concept of product topology and quotient topology,
- Prove a selection of theorems concerning topological spaces, continuous functions, product topologies, and quotient topologies.
- Prove a selection of theorems like Urysohn's Lemma and Tietze Extension Theorem, Tychonoff Theorems. Urysohn's Metrization Theorem
- Familiar with Embeddings.
- Define and illustrate the concepts of the separation axioms,
- Define The Fundamental Group and Covering Spaces, Homotopy of paths, The Fundamental Group, The Fundamental Group of the Circle and Covering Spaces.

**COURSE OUTCOME
SECOND SEMESTER
MAT2C09 Complex Analysis**

Upon successful completion of this course, a student will be able to:

- Represent complex numbers algebraically and geometrically,
- Define and analyze limits and continuity for complex functions as well as consequences of continuity,
- Apply the concept and consequences of analyticity and the Cauchy-Riemann equations and of results on harmonic and entire functions including the fundamental theorem of algebra,

- Analyze sequences and series of analytic functions and types of convergence,
- Evaluate complex contour integrals directly and by the fundamental theorem, apply the Cauchy integral theorem in its various versions, and the Cauchy integral formula, and
- Represent functions as Taylor, power and Laurent series, classify singularities and poles, find residues and evaluate complex integrals using the residue theorem
- Familiar with compactness and convergence in the space of analytic functions, spaces of analytic functions, The Riemann mapping theorem, Weierstrass factorization theorem and the gamma function.

**COURSE OUTCOME
SECOND SEMESTER
MAT2C10 Partial Differential Equations & integral equations**

Upon successful completion of this course, a student will be able to:

- Be familiar with the modeling assumptions and derivations that lead to PDEs,
- Recognize the major classification of PDEs and the qualitative differences between the classes of equations, and
- Be familiar with solving first and second order PDEs and integral equations.

**COURSE OUTCOME
THIRD SEMESTER
MAT3C11 Number Theory**

Upon successful completion of this course, a student will be able to:

- Define and interpret the concepts of divisibility, congruence, greatest common divisor, prime, and prime-factorization,
- Apply the Law of Quadratic Reciprocity and other methods to classify numbers as primitive roots, quadratic residues, and quadratic non-residues,
- Familiar with applications to Diophantine equations, cryptography, algebraic numbers, Quadratic and Cyclotomic fields.
- Formulate and prove conjectures about numeric patterns, and
- Produce rigorous arguments (proofs) centered on the material of number theory, most notably in the use of Mathematical Induction and/or the Well Ordering Principle in the proof of theorems.

COURSE OUTCOME
THIRD SEMESTER
MAT3C12 Functional Analysis

- Upon successful completion of this course, a student will be able to:
- Define and interpret the concepts of fundamentals of Normed Spaces.
 - Familiar with bounded linear maps on Banach Spaces.
 - Define and interpret the concepts inner product spaces, orthonormal sets, approximation and optimization, projection and Riesz Representation Theorems.

COURSE OUTCOME
THIRD SEMESTER
MAT3C13 Complex Function Theory

- Upon successful completion of this course, a student will be able to:
- Represent complex numbers algebraically and geometrically,
 - Define and analyze limits and continuity for complex functions as well as consequences of continuity,
 - Apply the concept and consequences of analyticity and the Cauchy-Riemann equations and of results on harmonic and entire functions including the fundamental theorem of algebra,
 - Analyze sequences and series of analytic functions and types of convergence,
 - Evaluate complex contour integrals directly and by the fundamental theorem, apply the Cauchy integral theorem in its various versions, and the Cauchy integral formula, and
 - Represent functions as Taylor, power and Laurent series, classify singularities and poles, find residues and evaluate complex integrals using the residue theorem
 - Familiar with elliptic functions, the Weierstrass theory, The Riemann Zeta function, harmonic and entire function in detail.

COURSE OUTCOME
THIRD SEMESTER
MAT3C14 Advanced Real Analysis

- Upon successful completion of this course, a student will be able to:
- Define and interpret the concepts of sequence and series of functions, uniform convergence continuity, uniform convergence and integration,

uniform convergence and differentiation, equicontinuous family of functions and the Stone-Weierstrass theorem,

- Familiar with the algebraic completeness of the complex field and fourier series. functions of several variables, the inverse function theorem, the implicit function theorem.
- Read and write mathematical proofs and do computations related to the above topics.
- Produce rigorous proofs of propositions arising in the context of real analysis.

COURSE OUTCOME

THIRD SEMESTER

MAT3E01 Elective- Graph Theory

Upon successful completion of this course, a student will be able to:

- To introduce the basic concepts in Graph theory.
- To create the ability to understand and appreciate mathematical arguments or proof logically.
- Helps to strengthen the ideas.
- Students will be able to model and solve real-world problems using graphs and trees, both quantitatively and qualitatively.

COURSE OUTCOME

FOURTH SEMESTER

MAT4C15 Operator Theory

Upon successful completion of this course, a student will be able to:

- Define and interpret the concepts of spectrum of a bounded operator, spaces of bounded linear functionals, spaces of bounded linear functional, bounded operators on Hilbert spaces

MAT4C16 Differential Geometry

Upon successful completion of this course, a student will be able to:

- Familiar with graphs and levels sets, vector fields, the tangent space, surfaces, vector fields on surfaces, curvature of plane, curvature of surfaces, parameterized surfaces, and local equivalence of surfaces.
- Produce rigorous proofs of propositions arising in the context of differential geometry.

MAT4E03 Elective- Fourier and Wavelet Analysis

Upon successful completion of this course, a student will be able to:

- Apply calculus, linear algebra, and mathematical transforms to real-world problems,
- Explain the connection between complex numbers and Fourier transforms to convolutions, filters, and their properties,
- Derive properties of orthogonal and bi-orthogonal wavelet transforms, and apply them to real-world problems,

DEPARTMENT OF PHYSICS

COURSE OUTCOME

CORE COURSE I: MECHANICS I

COURSE CODE: 1801PHY

- CO 1: Understand Newton's laws of motion, the concepts of linear and angular momentum and torque
- CO2: Determine the Centre mass of a given configuration
- CO3: Understand the principle of work, energy and power
- CO4: Determine angular momentum of a body about any given axis

CORE COURSE II: MATHEMATICAL PHYSICS AND ERROR ANALYSIS 2B02PHY

COURSE CODE:

- CO 1: Understand vector operations and vector algebra
- CO2: Determine derivative and integral of various functions
- CO3: State fundamental theorems of calculus
- CO4: Compare differential operators in various coordinate systems
- CO5: Understand the basic concepts of modelling
- CO6: Solve first order and second order ODEs
- CO7: Estimate uncertainties in measured values

CORE COURSE III: MECHANICS II

COURSE CODE: 3803PHY

- CO1: Understand the concept of Galilean transformations and uniformly accelerating systems
- CO2: Determine the trajectory of a body in central force problem using Newton's laws
- CO3: Understand Kepler's laws of planetary motion
- CO4: Formulate the mathematical equation of waves
- CO5: Understand the concept and consequences of special theory of relativity

CORE COURSE IV: ELECTRONICS I

COURSE CODE: 4804PHY

- CO 1: Understand the basics of PN junction diode, Zener diode and their applications
- CO2: Understand the structure, operations and characteristics of BJT and FET
- CO3: Understand the biasing methods and design of BJT and FET circuits
- CO4: Understand the different number systems, conversions and binary arithmetic operations
- CO5: Understand the basic combinational logic gates
- CO6: Understand the Boolean algebra & logic simplification using Boolean algebra

CORE COURSE V: - GENERAL PHYSICS PRACTICAL BASIC EXPERIMENTS IN PROPERTIES OF MATTER, OPTICS, ELECTRICITY & MAGNETISM

COURSE CODE: 4805PHY

- CO1: Familiarize with apparatus for mechanical, electrical, magnetic and optical experiments.
- CO2: Develop skill in setting up of apparatus for accurate measurement of physical quantities.
- CO3: Understand multiple experimental techniques for determining physical quantities.
- CO4: Develop skill in systematic way of measurements by minimizing possible errors.
- CO5: Develop skill to analyse by plotting graphs using software.
- CO6: Develop skill for systematic trouble shooting.
- CO7: Perform error analysis for experiments.

COURSE CODE: 5806PHY

CORE COURSE VI: QUANTUM MECHANICS

- CO 1: Understand the limitations of classical mechanics

- CO2: Explain Blackbody radiation problem, Photoelectric effect and Compton Effect using quantum theory of radiation
- CO3: Understand Rutherford, Bohr atom models and concept of energy and angular momentum quantisation
- CO4: Understand de-Broglie hypothesis, concept of wave nature of matter and Heisenberg uncertainty principle
- CO5: Determine probability of finding a particle and expectation values of variable using its wave function
- CO6: Write and solve Schrodinger equation for simple quantum mechanical systems
- CO7: State and explain Pauli's exclusion principle

CORE COURSE VII: ELECTROSTATICS AND MAGNETOSTATICS COURSE CODE: 5B07PHY

- CO1: Understand the concept of Electric field, electric potential, magnetic field and magnetic potentials
- CO2: Use the principle of superposition and law of Gauss to calculate electric field Intensity
- CO3: Determine Electric potential of charge distributions and hence specify electric field intensity
- CO4: Understand the basic properties of conductors and capacitors
- CO5: Calculate the magnetic fields due to currents using Biot-Savart and Ampere laws.
- CO6: Compare Magnetostatics and Electrostatics.
- CO7: Understand Diamagnets, Paramagnets and Ferro magnets.

CORE COURSE VIII: THERMODYNAMICS AND STATISTICAL MECHANICS

COURSE CODE: 5B08PHY

- CO 1: Understand the concept of temperature, the thermodynamic state and equilibrium.
- CO2: Explain the first law of thermodynamics through work and heat and its Mathematical Formulation.
- CO3: Understand the ideal gas equation and kinetic theory of gases
- CO4: Understand the second law of thermodynamics and thermodynamic temperature scale.
- CO5: Define entropy and thermodynamic potentials
- CO6: Understand the basic concepts of Statistical mechanics

CORE COURSE IX: ELECTRONICS II

COURSE CODE: 5B09PHY

- CO 1: Understand the AC analysis of BJT circuits and CE amplifiers
- CO2: Understand the feedback circuits, oscillators and power amplifiers
- CO3: Understand OPAMP basics and different OPAMP circuits
- CO4: Understand the standard forms Boolean Expressions, Functions of Combinational Logic and K map simplifications.

CORE COURSE X: SOLID STATE PHYSICS & SPECTROSCOPY

COURSE CODE: 6B10PHY

- CO 1: Understand basic crystal structure and compare various crystal systems
- CO2: State and prove Bragg's law
- CO3: Explain X-ray diffraction and various methods to obtain diffraction pattern.
- CO4: Understand basic properties of semiconductors and band structure of solids
- CO5: Discuss Hall Effect and list its applications
- CO6: Describe various regions of EM spectrum
- CO7: Distinguish between microwave and infrared spectroscopy
- CO8: Define Raman Effect and explain its quantum theory

CORE COURSE XI: OPTICS&PHOTONICS

COURSE CODE: 6B11PHY

- CO 1: Understand the concept of interference and diffraction
- CO2: Distinguish between Fresnel and Fraunhofer diffraction

- CO3: Analyse mathematically diffraction pattern due to slits and apertures
- CO4: Understand the concept of polarization and double refraction
- CO5: Understand the basic principle and working of lasers
- CO6: Explain different types of lasers
- CO7: Understand the principle of holography and its applications
- CO8: Understand the principle of total internal reflection and propagation of light through optical fibres
- CO9: Compare different types of optical fibres and their applications Optics and Photonics

CORE COURSE XII NUCLEAR, PARTICLE & ASTROPHYSICS

COURSE CODE: 6B12PHY

- CO 1: Understand the structure nucleus and nuclear constituents
- CO2: Define nuclear forces and nuclear reactions
- CO3: Familiarize elementary particles and their properties
- CO4: Understand stellar classifications
- CO5: Understand basic concepts of birth of the star
- CO6: Identify different stars in HR diagram
- CO7: Understand the theory of death of the star
- CO8: Define white dwarf, neutron star and black hole

CORE COURSE XIII: ELECTRODYNAMICS AND CIRCUIT THEORY

COURSE CODE: 6B13PHY

- CO 1: Understand the basic concepts of Electrodynamics
- CO2: Explain the mathematical theory of Electromagnetic waves
- CO3: Understand different Network theorems
- CO4: Understand the basic concepts of Transient currents

CORE COURSE XIV: DISCIPLINE SPECIFIC ELECTIVE

6B14 PHY (1) PYTHON PROGRAMMING

- CO 1: Develop skills in creating program sketches of scientific problems
- CO2: Develop basic skills in logical thinking and programming
- CO3: To make real-life scientific problems easier on a computer with user interaction and graphics

6B14 PHY (2) NANOSCIENCE

- CO 1: Understand the basic concepts of Nanoscience
- CO2: Understand the properties of materials in the nano range
- CO3: Identify different techniques for the production of nanomaterials
- CO4: Understand characterization techniques & applications of nanomaterial.

6B14 PHY (3) MATERIAL SCIENCE

- CO 1: Understand the basic concepts of material science
- CO2: Understand the properties of materials
- CO3: Identify different engineering materials & their properties
- CO4: Understand the properties & characteristics of semiconducting, insulating & magnetic materials

6B14 PHY (4) COSMOLOGY

- CO 1: Understand history of cosmology at different era
- CO2: Explain general theory of relativity and curvature of space
- CO3: Understand cosmological principle and Friedmann model
- CO4: Explain expansion of universe based on Hubble's law and to state big bang theory

6B14 PHY (5) PLASMA PHYSICS

CO 1: define plasma and plasma parameters

CO2: Understand applications of plasma

CO3: determine the behaviour of plasma in various E and B Fields

CO4: Determine the nature of plasma as a fluid

CORE COURSE XV: Practical II General Physics II COURSE CODE: 6B15PHY

CO1: Familiarise with apparatus for mechanical, electrical, magnetic and optical experiments.

CO2: Develop skill in setting up of apparatus for accurate measurement of physical quantities.

CO3: Understand multiple experimental techniques for determining physical quantities.

CO4: Develop skill in systematic way of measurements by minimising possible errors.

CO5: Develop skill to analyse by plotting graphs using software.

CO6: Develop skill for systematic trouble shooting.

CO7: Perform error analysis for experiments.

CORE COURSE XVI: PRACTICAL III ELECTRONICS

COURSE CODE: 6B16PHY

CO1: Familiarise active and passive electronic components.

CO2: Familiarise multimeter, power supply, signal generator and cathode ray oscilloscope.

CO3: Develop skill in soldering and use of breadboard.

CO4: Develop skill in construction of rectifiers, voltage regulators, amplifiers and oscillators.

CO5: Observe, measure and analyse electrical signals.

CO6: Develop skill for trouble shooting circuits and components.

CO7: Develop skill to analyse by plotting graphs using software.

PHYSICS COMPLEMENTARY ELECTIVE COURSES

COMPLEMENTARY ELECTIVE COURSE I: -MECHANICS

COURSE CODE: 1C01PHY

CO 1: Understand the basic concepts of Properties of matter

CO2: Explain the dynamics of rigid bodies.

CO3: Understand the basic concepts of wave motion and oscillations

COMPLEMENTARY ELECTIVE COURSE II: ELECTRICITY, MAGNETISM, THERMODYNAMICS
COURSE CODE: 2C02PHY

CO 1: Understand the basic concepts of Magnetism &electricity

CO2: Explain the magnetic effects of electric currents

CO3: Understand the basic principles of Thermodynamics

COMPLEMENTARY ELECTIVE COURSE III: OPTICS AND PHOTONICS
COURSE CODE: 3C03PHY

CO 1: Understand the basic concepts of Interference

CO2: Understand the basic concepts of Diffraction.

CO3: Understand the basic concepts of Polarization

CO4: Understand the basic concepts of Photonics and Fibre Optics

COMPLEMENTARY ELECTIVE COURSEIV: ELECTRONICS AND MODERN PHYSICS
COURSE CODE: 4C04PHY

CO 1: Understand the basic concepts of Basic electronics

CO2: Understand the basic concepts of Digital electronics.

C03: Understand the basic concepts of Nuclear Physics

C04: Understand the basic concepts of Particle physics and Astrophysics.

COMPLEMENTARY COURSE V – PHYSICS PRACTICAL

COURSE CODE: 4C05PHY

C01: Familiarise with apparatus for experiments in mechanics, optics, electricity and magnetism and

electronics and electronics experiments.

C02: Develop skill in setting up of apparatus for accurate measurement of physical quantities.

C03: Understand multiple experimental techniques for determining physical quantities.

C04: Develop skill in systematic way of measurements by minimizing possible errors.

DEPARTMENT OF ZOOLOGY

COURSE OUTCOMES

PROTISTA AND NONCHORDATA – I Code: 1B01ZLG

- CO1. To understand the basic methods in zoology and animal classification.
- CO2. Able to appreciate the process of evolution (unicellular cells to complex, multicellular organisms)
- CO3. Familiar with the protist and non-chordate world (from Phylum Porifera to Mesozoa) that surrounds us.
- CO4. Able to identify the invertebrates (from Phylum Porifera to Mesozoa) and classify them up to the class level with the basis of systematics
- CO5. Understand the basis of life processes in the non-chordates (from Phylum Porifera to Mesozoa) and recognize the economically important invertebrate fauna.

NONCHORDATA – 2 Code: 2B02ZLG

- CO1. Familiar with the non-chordate world (Coelomates - from Phylum Annelida to Hemichordata) that surrounds us.
- CO2. Able to identify the invertebrates (Coelomates - from Phylum Annelida to Hemichordata) and classify them up to the class level with the basis of systematics
- CO3. Understand the basis of life processes in the non-chordates (from Coelomates – from Phylum Annelida to Hemichordata) and recognize the economically important invertebrate fauna.

Chordata – I Code: 3B03ZLG

- CO1: Understand the origin and evolutionary relationship in different subphyla of chordates.
- CO2: To understand the diversity of chordates (from urochordates to reptiles).
- CO3: Understand the unique characters of urochordates, cephalochordates and vertebrates
- CO4: Recognize life functions of chordates (from urochordates to reptiles).

Chordata – II and Comparative Anatomy Code: 4B04ZLG

CO1: Understand the general and unique characteristics and classification of Aves and Mammals

CO2: Understand the diversity and relation in form and structure of chordates.

EVOLUTION, ETHOLOGY AND RESEARCH METHODOLOGY

Code: 5B05ZLG

CO1. Realise that the whole living system has a common ancestry and so all are related

CO2. Realise the fundamental characteristics of science as a human enterprise

CO3. Apply scientific methods in day to day life

CO4. Able to design a research work on a topic

ANIMAL PHYSIOLOGY Code: 5B06ZLG

CO1. Understand the function of various systems at cellular and system levels

CO2. Understand the mechanisms that work to keep the body alive and functioning

CO3. Apply the knowledge to lead a healthy life

BIOCHEMISTRY AND BIOPHYSICS Code: 5B07ZLG

CO1. Understand the importance of Bio molecules

CO2. Familiar with various biochemical pathways

CO3 : Develop knowledge about equipment like microscopes, spectrophotometers, centrifuges etc

GENETICS CODE: 5B08ZLG

1. Comprehensive and detailed understanding of the chemical basis of heredity.

2. Understanding about the role of genetics in evolution.

3. The ability to evaluate conclusions that are based on genetic data.

4. The ability to understand results of genetic experimentation in animals.

CELL BIOLOGY, IMMUNOLOGY AND MICROBIOLOGY

CODE: 6B09ZLG

CO1. Structural and functional aspects of basic unit of life i.e. cell concepts

CO2. Gather basic concepts of Cell Biology along with various cellular functions

CO3. Understand the basic concepts of immunity

CO3. Understand the diversity of microbes and their use and harm

Code: 6B 10 ZLG MOLECULAR BIOLOGY & BIOINFORMATICS

CO1. Understand the importance of Bio molecules

CO2. Familiar with various tools and applications of Bioinformatics

Code: 6B 11 ZLG

ENVIRONMENTAL SCIENCE

CO1. Able to describe the relation between abiotic and biotic factors.

CO2. Students are able to describe various biological interactions.

CO3. Students are able to understand how change in population affect the ecosystem

CODE:6B 12 ZLG

DEVELOPMENTAL BIOLOGY

CO 1 : Understand the major steps in embryological development.

CO 2: Understand the intricate mechanisms involved in the development of animals.

COMPLIMENTARY

GENERAL LABORATORY TECHNIQUES 1C 01BGT

CO 1 : Understand the basic laboratory techniques

CO 2 :Develop an understanding of the methods used in routine lab work.

2C 02 BGT LABORATORY EQUIPMENTS AND TECHNIQUES

CO 1 : Acquire sound knowledge on the basic principles of common equipment used in biological laboratories

3C 03 BGT

PREPARATION OF BIOLOGICAL SPECIMENS

CO 1 : Acquires basic knowledge on preparation of lab specimens for display in biology museums and also for other laboratory purposes

4C 04BGT ADVANCED BIOLOGICAL TECHNIQUES:

CO 1 : Get exposed to some of the advance techniques in biology

CO 2 :Familiarize the student with the modern innovative techniques and terminologies currently used.