2019-20

PROGRAMME OUTCOMES

Programme Outcomes (PO)	Short Title of the POs (PO)	Description of the Programme Outcomes Graduates will be able to :
PO-1	Problem Analysis and Solutions	Think critically, identify, analyze problems/ situations and further attempt to design/ develop solutions that meet the specified goals.
PO-2	Use of Technology	Apply appropriate IT tools efficiently in their daily activities of communication and academics.
PO-3	Environment and Sustainability	Analyze and attempt solutions to environmental issues and commit themselves to sustainable development in the local/ national and global context.
PO-4	Ethics	Recognize and understand professional ethics /human values and be responsible for the same.
PO-5	Individual and Team Work	Function effectively at various levels, capacities and situations.
PO-6	Communication	Communicate proficiently (oral and written) as a responsible member of society.
PO-7	Research Aptitude	Understand general research methods and be able to analyse, interpret and derive rational conclusions.
PO-8	Life Skills	Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of domain specific change.

Chowgule College of Arts & Science (Autonomous) Parvatibai MARGAO GOA

Programme Specific Outcome (PSO) for B.Sc. Computer Science

At the end of the programme the students will be able to:
PSO1: Analyze a Software problem, design, implement a solution and evaluate the proposed solution to ensure that it meets customer needs and Software standard.
PSO2: Use and Apply appropriate current technologies, techniques and modern tools necessary for computing practice.
PSO3: Embark on an Entrepreneurial venture or be eligible for employment in IT industry or pursue higher education.
PSO4: Apply the concept of networking and security features in designing the systems.

Course Title	Course Outcome
Mathematical Foundation of Computer Science I	CO1: Explain various fundamental concepts. CO2: Convert a given number from one base to another. CO3: Apply counting principles to determine probabilities. CO4: Demonstrate an understanding of relations and functions and determine their properties. CO5: Evaluate Boolean functions and simplify expressions using the properties of Boolean algebra. CO6: Write an argument using logical notation and determine if the argument is valid or not. CO7: Construct and analyze finite state automata.
Introduction to Programming	CO1: Explain problem solving strategies. CO2: Draw a flowchart for a given problem. CO3: Write an algorithm for a given problem. CO4: Explain and Apply sorting and searching algorithms. CO5: Recognize and incorporate programming elements such as loops, decision making, functions, arrays, string. CO6: Recognize and incorporate programming elements such as structures, pointers and files into applications that solve real world problems.
Data Base Management Systems -I	CO1: Explain the various database concepts and the need for database systems. CO2: Identify different entities and relationship between them. CO3: Represent the given system using ER diagram. CO4: Convert an ER diagram to a database schema. CO5: Formulate queries in Relational Algebra, SQL to manipulate the database. CO6: Analyze the schema to see if they fulfill Normalization criterion. CO7: Design database using appropriate RDBMS.

	CO8: Design User Interface for Database. CO9: Design Reports for Database.
Data Structures	CO1 : Define relevant standard algorithms for various data structures. Learn various applications of data structures. CO2 : Implementation of data structures. CO3 : Use various data structures for sorting and searching. CO4 : Analyze and compare algorithms for efficiency using Big-O notation. CO5 : Formulate new solutions for programming problems.
Object Oriented Programming	CO1 : Apply fundamental object-oriented concepts in problem solving. CO2: Analyze problem scenario and identify classes/objects, their properties/functionalities and associations. CO3 : Analyze the problem scenario and model the system using UML diagrams. CO4 : Implement the object oriented model in any object oriented language.
Software Engineering	CO1: Understand the various Software Development Methodologies CO2: Apply Estimation techniques to live projects CO3: Analyze Software Projects. CO4: Design Software Projects.
Digital Logic Design	CO1: Convert values between various number systems/codes. CO2: Simplify the logical expression using Boolean algebra. CO3: Design, simplify and implement combinational logic circuits. CO4: Design and implement the sequential logic circuit and their applications. CO5: Explain the methods of D/A converter and A/D converters (Successive Approximation method). CO6: Explain the classifications and characteristics of semi conductor memories with memory expansion.
Mathematical Foundation of Computer Science - II	CO1: Describe the following concepts: Graph theory and Numerical analysis. CO2: Apply the Interpolation methods for solving the problems numerically.

	CO3: Demonstrate the process of curve fitting of data. CO4: Determine the roots of polynomial equations. CO5: Construct and solve real-world problems using graphs and trees.
Web Designing	CO1:Design Content for a web application. CO2:Style content so as to provide an effective User Interface. CO3:Provide for dynamism in the User Interface to enhance usability. CO4:Develop a static web application.
Computer Architecture and Organization	CO1: Identify various components of the Computer System. CO2: Explain the detailed function of a typical microprocessor and its control unit. CO3: Implement Assembly Language Program for 8086 processor for a given task. CO4: Differentiate the function and role of semiconductor memories and map the cache memory for the given scenario. CO5: Appraise the importance of input/output modules and Interrupts and their functions. CO6: Distinguish the characteristics and function of I/O interfaces to computer system. CO7: Illustrate the function of pipelined architecture and classify the Multiprocessor systems.
Design and Analysis of Algorithms	CO1: To analyze the performance of algorithms. CO2: Choose appropriate algorithm design techniques for solving problems. CO3: Analyze empirical results to get a deeper understanding of the algorithmic solutions. CO4: Apply important algorithmic design paradigms and methods of analysis.
Mobile Application Development	CO1: Explain mobile devices, including their capabilities and limitations. CO2: Review current mobile platforms and their architectures. CO3: Develop mobile applications on a popular mobile platform. CO4: Evaluate development with another mobile platform.
Server Side Programming	CO1:Design and implement server-side scripts. CO2:Create and manipulate databases using SQL and server side technologies. CO3:Create data documents using XML/JSON.

	CO4:Enhancing web applications using AJAX and XML/JSON. CO5:Develop dynamic web applications using the object oriented paradigm.
Human Computer Interface	CO 1: To understand the intricacies of human interaction with a computer System. CO 2: To understand the concept of a graphical user interface, and its design characteristics. CO 3: To recognize the human element its strengths and weakness for computer interaction. CO 4: To know the principles of good screen design and layouts. CO 5: To know the different navigation schemes on windows-based interface; learn the different types of selection devices and components of a window-based interface. CO 6: To know the different types of interaction devices and media.

PGDCA

Course Title	Course Outcomes
Problem Solving and Introduction to Programming	CO1: Explain problem solving strategies. CO2: Draw a flowchart for a given problem. CO3: Write an algorithm for a given problem. CO4: Implement sorting and searching algorithms. CO5: Recognize and incorporate programming elements such as loops, decision making, functions, string, list, tuple, dictionary and files in to applications that solve real world problems.
Data Base Management Systems	CO1: Explain database concepts and the need for the same. CO2:Identify different entities and relationship between them. CO3:Represent the given system diagrammatically using ER diagram. CO4:Convert an ER diagram to a schema and effectively represent it using appropriate RDBMS. CO5:Formulate queries in Relational Algebra, SQL to manipulate the database. CO6:Analyze the schema to see if they fulfill Normalization criterion
Client Side Technologies	CO1: Design Content for a web application CO2: Style content so as to provide an effective User Interface

	CO3: Provide for dynamism in the User Interface to enhance usability CO4: Develop a static web application
Computer Networks	CO1: Appreciate the need for Network and various layers of OSI and TCP/IP reference model. CO2: Explain various Data Communications media. CO3: Identify the different types of network topologies and Switching methods. CO4: Describe various Data link Layer Protocols. CO5: Identify the different types of network devices and their functions within a network. CO6: Compare various Classeless and Classfull IP addresses with Subneting concept. CO7: Analyze and Interpret various Network and Transport Layer protocols CO8: Explain different application layer protocols
Software Engineering	CO1: Understand the various Software Development Methodologies CO2: Apply Estimation techniques to live projects CO3: Analyze Software Projects. CO4: Design Software Projects.
Multimedia	CO1: Explain the concept of Multimedia – Components, Team members and their roles. CO2: Identify and describe the function of the general skill sets in the multimedia industry. CO3: Classify and realize the types of Authoring tools and their functions. CO4: Analyze the requirements of Multimedia product. CO5: Perform the editing features for Images, Sound and Video. CO6: Create animation using basic features. CO7: Develop a multimedia product using any authoring tools. CO8: Assemble and deliver multimedia projects.
E-Learning	CO1: Explain the working of an E-learning module. CO2: Explain the various Instructional Design Principles. CO3: Develop own course material and upload it using an appropriate LMS. CO4: Evaluate and apply appropriate Assessment techniques to the E-content CO5: Differentiate between Summative and Formative assessment. CO6: Write Learning and Course objectives.

Human Computer Interface	CO1: Understand the intricacies of human interaction with a computer System. CO2: Understand the principles of good screen design and layouts and requirements. CO3: Understand the different navigation schemes on windows-based interface; learn the different types of selection devices and components of a window-based interface. CO4: Classify human users based on their abilities, personalities. CO6: Designing prototypes. Evaluate the design of user interfaces. Compare the interfaces different products.
E-Commerce	CO1:Explain the various E-Commerce Strategies. CO2: Explain the working of an E-Commerce Website. CO3: Evaluate the various Payment Mechanisms. CO4: Develop an E-Commerce Website. CO5: Create an online store. CO6: Recognize and discuss global E-commerce issues CO7:Analyze the impact of E-commerce on business models.
Digital Marketing	CO1: Optimize the website for various search engines. CO2: Market the products/services/facilities using Search Engine. CO3: Market the products/services/facilities using Social Media. CO4: Market the products/services/facilities using Email. CO5: Analyze the Web for improving the marketing strategy. CO6: Understand the concept of Marketing Automation. CO7: Use various software tools to implement Digital Marketing.
Network Administration	CO1:Understand the basic working of reference model of communication to provide end to end services for the various applications. CO2:Analyse the various behaviour of network protocols using the networking tools. CO3:Understand the basics of IP. CO4:Design the basic computer network and maintain the network. CO5: Create and manage users and groups. CO6: Configure routers and basic network application.
Software Testing	CO1 : Understand the different software testing strategies. CO2 : Apply testing strategies to live projects. CO3 : Design test cases CO4: Execute test cases using software testing tools .
Server Side Programming	CO1 : Get hands-on programming experience using open -source software, PHP and MySQL to build

	professional-quality, database-driven websites. CO2 : Develop the skills to build interactive web sites with authentication and security by integrating PHP with HTML and CSS. CO3 : Apply basic and advanced object-oriented programming techniques, use libraries, frameworks and advanced database connectivity techniques, and integrate PHP with other web technologies to build secure e-commerce applications. CO4 : Customize an application to meet the specific needs of a client use case as would be done in a real-world application.
Data Structures	CO1 : Define relevant standard algorithms for various data structures. Learn various applications of data structures. CO2 : Implementation of data structures. CO3 : Use various data structures for sorting and searching. CO4 : Analyze and compare algorithms for efficiency using Big-O notation. CO5 : Formulate new solutions for programming problems.
Office Automation Tools	CO1: Understand basic Spreadsheet features. CO2: Work with different worksheets. CO3: Analyze the data using various graphs. CO4: Analyze data using various spreadsheet features such as lookup tables, Pivot tables, and other statistical features. CO5: Use different features of DTP software. CO6: Develop a desktop Publishing Application using given software.

B.Voc(Software Development)

Course Title	Course Outcome
Computer Organization And Operating System	CO1: Describe Von Neumann architecture. CO2: Explain Basic Structure, Function and Operation of a digital computer. CO3: Explain Memory Subsystem in a computer. CO4: Describe the function of a Processor, Memory, I/O and System Bus. CO5: State the difference between various types of Operating Systems. CO6: Explain the role an OS plays in Memory, Processor and Storage Management.

Web Design	CO1: Demonstrate the use of various HTML and CSS elements CO2: Design responsive websites CO3: Implement frameworks used in web designing. CO4: Build interactive applications using Javascript CO5: Apply markup language for presenting of information in web pages
Introduction to Programming	CO1: Explain the different programming paradigms. CO2: Write computer program to solve basic computational problems. CO3: Write computer program that perform basic I/O operations. CO4: Use python function, modules and exceptions effectively for solving complex problems.
Database Management System	CO1: Model an application's data requirements using conceptual modeling tools like ER diagrams. CO2: Apply Normalization theory to normalization a database. CO3: Use a database management system to create, populate, maintain, and query a Database. CO4: Analyze a given problem and select an appropriate database.
Multimedia	CO1: Develop specific skills in designing Graphical Images, Audio and Video Capture and Editing using Software tools CO2: Explain the industrial standard of video, audio and image formats. CO3: Explain were and when to use image manipulation software tools. CO4: Describe the process of editing audio/video/image content.
Object Oriented Paradigm	CO1 : Explain the benefits of object oriented design and understand when it is an appropriate methodology to use. CO2 :Differentiate between the top-down and bottom-up approach. CO3:Develop problem-solving and programming skills using the OOP concept. CO4 :Apply the concepts of object-oriented programming using Java. CO5: Design object oriented solutions for small systems involving multiple objects.

	CO6: Develop GUI for an application.
Computer Networks	CO1: Select the most appropriate networking architecture and technologies for the given organization structure. CO2: Compare and contrast the layers in OSI model and TCP/IP. CO3: Explain the functionalities provided by each layer in the OSI model. CO4: Define the concept used for error handling in Datalink layer CO5: Develop client server programs for different applications. CO6: Design basic computer network
Server Side programming	CO1: Explain the core features and functionalities of PHP CO2: Design interactive web application using core PHP CO3: Develop basic server side script to interact with users and the database CO4: Build a web application using laravel framework CO5: Utilize MVC model
Web Development Framework	CO1: Use ReactJS to build rich and interactive front end applications. CO2: Use NodeJS to develop back end application to accept POST,GET,PUT,DELETE requests. CO3: Develop REST API's using NodeJS. CO4: Write non-blocking and blocking JavaScript code. CO5: Explain Framework and Libraries with respect Web Development.
Software Engineering	CO1 :Understand the various Software Development Methodologies CO2: Apply Estimation techniques to live projects CO3: Analyze Software Projects. CO4: Design Software Projects.
Mobile Application Development	CO1: Define mobile platforms and their architectures. CO2: Compare development for different mobile platforms. CO3: Demonstrate the use of Android Components. CO4: Develop Mobile applications for Android Platform. CO5: Make use of SQLite database. CO6: Test Mobile applications for Android Platform.
Data Structure	CO1: Select appropriate data structures as applied to specified problem definition.

	CO2: Implement operations like searching, insertion, and deletion, traversing mechanism etc. On various data structures CO3: make use of appropriate sorting/searching technique for given problem CO4: Design advance data structure using NonLinear data structure.
Software Testing	CO1: Define Software Testing process for an applications. CO2: Apply Software Testing process in relation to Software Development and Project Management. CO3: Create Test Strategies and plans, design test cases, prioritize and execute them. CO4: Identify various Software Testing problems and solve them. CO5: Identify the needs of software test automation, and define and develop a test tool to support test automation. CO6: Use software testing methods and modern software testing tools for their testing projects
Design Analysis of Algorithms	CO1: Explain basic concepts related to the design and analysis of algorithms. CO2: Describe divide-and-conquer paradigm, Dynamic Paradigm and Greedy Paradigm and explain when an algorithmic design situation calls for it CO3: Explain the major graph algorithms and their analyses. CO4: Analyze the performance of an Algorithm. CO5:Choose appropriate algorithm and design technique for solving problem.
Cloud Computing	CO1: Explain the core concepts of the cloud computing paradigm. CO2: Characterize the different cloud services ie. Infrastructure, Platform and Software as a Service (IaaS, PaaS, SaaS). CO3: Deploy application in a production environment. CO4: Host a cloud platform like Apache OwnStack and Owncloud

M.Sc Information Technology

Data Structures and Algorithms	CO1: Demonstrate advantages and disadvantages of specific algorithms and data structures CO2: Evaluate algorithms and data structures in terms of time and memory complexity of basic operations. CO3: Design and analyze the time and space efficiency of the data structure. CO4: Formulate new solutions for programming problems or improve existing code using learned algorithms and data structure.
Operating Systems and Networks	CO1: Analyze the structure of Operating system. CO2: Analyze various Resource management and fault tolerance techniques for real time systems. CO3: Discuss the fundamentals of IP addressing. CO4: Apply subnet masking concepts to allocate space for host in subnet. CO5: Examine techniques to protect the network.
Software Architecture, Design Patterns and Frameworks	CO1: Apply various concepts of Object-Oriented Analysis and Design while solving problems. CO2: Analyze a problem scenario and prepare various models of the solution. CO3: Analyze a given problem and study the applicability of Design Patterns to the problem. CO4: Generate code skeletons in any OO programming language from UML class diagram.
Design and Analysis of Algorithms	CO1: Analyze the running time of various algorithms. CO2: Apply the algorithms and techniques to solve various problems. CO3: Analyze the complexities of various problems in different domains. CO4: Design their own algorithmic strategies to solve problems and analyze their correctness.
Advanced Database Management Systems	CO1: Critically evaluate alternative designs and architectures for Databases and Data Warehouses. CO2:Evaluate methods of storing, managing and interrogating complex data. CO3: Analyze the background processes involved in optimizing queries and transactions. CO4: Develop a high-level understanding of major DBMS components and their function.

Data Mining	CO1: Identify appropriate data mining algorithms to solve real world problems CO2: Apply various Association Rules Mining Algorithms. CO3: Use Decision Trees, Bayesian Classification, Artificial Neural Networks and Fuzzy Set Theory while solving classification problems. CO4: Apply various types of Clustering Algorithms, Web Mining Techniques and techniques of mining complex types of data.
Information Retrieval	CO1: Develop system for IR using various models. CO2: Perform Query evaluation and Relevance feedback. CO3: Design systems that include hyperlinks, multimedia and the web. CO4: Apply XML, Parallel, Distributed and Multimedia IR concepts to relevant problems.
Software Metrics & Project Management	CO1: Identify and describe the key phases of project management. CO2: Apply Scope, Time and Cost Management process to Software Development. CO3: Define software metrics and quality standards. CO4: Plan a metrics measurement program CO5: Enforce Quality standards in projects
Mobile Computing	CO1: Apply data communicating methods and networking protocols for wireless and mobile environments. CO2: Understand positioning techniques and location based services and applications. CO3: Utilize and employ application frameworks for developing mobile applications. CO4: Use java for wireless devices and understand wireless messaging.
Compiler Design	CO1: Convert a NFA to DFA and minimize the DFA. CO2: Perform Lexical Analysis using tools such as Lex and YACC. CO3: Apply the concepts of Register allocation. CO4: Design and code a simple compiler for a programming language.
Computer Graphics	CO1: Describe the purpose of Computer Graphics and its applications. CO2:Comprehend and analyze the fundamentals of

	animation, underlying principles, and applications. CO3: Apply 3D Transformation on the object. CO4: Extract scene with different clipping methods and its transformation to graphics display device. CO5: Develop familiarity with key algorithms for modelling and rendering graphical data. CO6: Design interactive computer graphics programs using Babylon JS.
Natural Language Processing	CO1: Compose key NLP elements to develop higher level processing chains. CO2: Assess / Evaluate NLP based systems. CO3: Choose appropriate solutions for solving typical NLP sub problems (tokenizing, tagging, parsing). CO4: Perform Lexical and Semantic Analysis.
Image Processing	CO1:Comprehend how digital images are represented and manipulated in a computer, including reading and writing from storage, and display. CO2: Analyze and implement image processing algorithms. CO3: Perform Image Compression. CO4: Apply Morphological Image Processing.
Middleware Technology	CO1: Apply the concepts of distributed systems, asynchronous communication and event-based systems to real-world problems. CO2: Develop Web programs using the Servlet technology and Enterprise Java beans. CO3: Use web services and reflective middleware concepts for real-world problems. CO4: Apply concepts that are learnt while working in live projects that involve Web Component and Business Component Programming.
Software Testing	CO1: Define Software Testing process for applications. CO2: Apply Software Testing process in relation to Software Development and Project Management. CO3: Create Test Strategies and plans, design test cases, prioritize and execute them. CO4: Identify various Software Testing problems and solve them. CO5: Identify the needs of software test automation, and define and develop a test tool to support test automation. CO6: Use software testing methods and modern software

	testing tools for their testing projects.
Cloud Computing	CO1:Define main concepts, key technologies, strengths, and limitations of cloud computing and the possible applications for cloud computing. CO2:Identify the architecture and infrastructure of cloud computing, including SaaS, PaaS, IaaS, public cloud, private cloud, hybrid cloud, etc. CO3:Explain the core issues of cloud computing such as security, privacy, and interoperability. CO4: Provide the appropriate cloud computing solutions and recommendations according to the applications used. CO5: Implement Virtualization
Network Security	CO1: Classify the symmetric encryption techniques CO2: Illustrate various Public key cryptographic techniques CO3: Evaluate the authentication and hash algorithms. CO4: Implement Cryptographic Algorithms in a programming language.
Communication Skills Course	CO1: Apply creative thinking abilities necessary for effective communication at a modern workplace. CO2: Demonstrate clarity, precision, conciseness and coherence in the use of language. CO3: Learn to make one's writing better, faster and more successful. CO4: Speak effectively while using non-verbal skills. CO5: Design effective presentations that disseminate information, conduct negotiations and use persuasion.
Applied Probability and Statistics	CO1: Apply knowledge about the probability theory to solve mathematical problems. CO2: Solve problems containing Discrete and Continuous Random variables. CO3: Apply the concepts of Statistical Inference to Mathematical problems. CO4: Provide statistical quality control.
Machine Learning	CO1: Design and Implement Machine Learning solutions to real-world problems. CO2: Evaluate and interpret the result of Machine Learning Algorithms. CO3: Recognize various ways of selecting suitable model parameters for different machine learning techniques.

	CO4: Perform experiments in Machine Learning using real-world data.
Statistical Computing	CO1: Configure software environment to develop programs to implement statistical concepts. CO2: Generate various types of plots and charts. CO3: Determine and apply relevant statistical test for real-life problems. CO4: Use various types of distributions and statistical tests for solving problems.
Educational Technology	CO1: Identify the role of educational technology in teaching. CO2: Integrate technology in the classroom after determining technology requirements CO3: Perform research in the Educational Technology domain. CO4: Use ICT tools in a particular course.

Biotechnology

Course Title	Course Outcomes
Biomolecules	CO1: Discuss the structure of atoms, biomolecules and chemical bonds. CO2: Understand concepts of enzyme kinetics, bio polymers and metabolic reactions in a living system. CO3: Understand and apply general laboratory safety measures as well as calculate for preparation of various chemicals for experiments. CO4: Prepare different solutions such as buffers, reagents and stock solutions for experiments independently. CO5: Operate various lab instruments such as weighing balance, water bath and spectrophotometer.
Cell Biology	CO1: Correlate the function of each cell organelle with proper coordination. CO2: Demonstrate an understanding of cell communication.. CO3: Prepare various plant and animal specimen for observation of cell structures CO4: Identify and analyze different biological cells using a compound microscope.
Fundamental Genetics	CO1: Outline the basic principles of Mendelian genetics and compare and analyze different inheritance patterns as well as

	solve problems based on genetic principles. CO2: Compare and contrast different mutations, their effects on cells and the application of the same to research. CO3: Differentiate between the structure and working of a compound and dissection microscope. CO4: Construct and interpret a karyotype prepared from a spread of metaphase chromosomes.
Basic Microbiology	CO1: Understand the scope and importance of Microbiology, classification schemes, cultivation, preservation and maintenance of the microbial cultures. CO2: Discriminate between various groups of microorganisms and also comprehend the beneficial and harmful effects of each group of microorganisms. CO3: Compare, analyze and apply concepts of the principle and working of various types of microscopes. CO4: Adhere to strict laboratory safety measures to be followed in a microbiology laboratory. CO5: Master skills in aseptic techniques as well comprehend the importance of cleaning and decontamination.
Food and Fermentation Technology	CO1: Understand the role of microorganisms in the production of fermented foods. CO2: Prepare need-based fermented products from cereals, dairy and non-dairy sources. CO3: Understand the significance of microorganisms in the preparation of beverages. CO4: Enhance the nutritional content of various products through the knowledge and skills obtained in this course.

Physics

PROGRAMME SPECIFIC OUTCOMES (PSOs)

PSO1 : Strengthen the understanding of basic concepts of Physics and impart required mathematical skills.

PSO2 : Provide a strong base in Experimental Physics to pursue higher studies/research in Experimental Physics.

PSO3 : Provide a sound foundation in Theoretical Physics to pursue higher studies/research in Theoretical Physics

PSO4 : Developing analytical thinking and logical reasoning.

PSO5: Enhancing problem solving skills.

PSO6 : Promote self-learning, self-confidence, communication skills and team work.

PSO7: Enhancing employability through skill enhancement courses.

Introduction to Mathematical Physics	CO1: Have a good understanding of vector analysis and its application in physics. CO2: Have a good grasp on various tests used to test the convergence and divergence of different kinds of series and learn how to expand a function in power series. CO3: Understand the basics of complex numbers. CO4: Have an understanding of matrix operations and properties of matrices. CO5: Learn basics of partial differentiation and its application in physics. CO6: Be able to solve ordinary first and second order differential equations important in the physical sciences, CO7: familiarize with spherical and cylindrical coordinate systems. CO8: Use mathematical techniques to solve several problems in physics and enhance problem solving skills.
Mechanics I	CO1: develop qualitative and quantitative understanding of Newtonian mechanics in one and two dimensions and solve the Newton equations for simple configurations. CO2: understand the Law of Conservation of Linear Momentum and Angular Momentum and apply these laws to understand elastic and inelastic collision, motion of a rocket and Kepler's law. CO3: demonstrate the knowledge of work and energy in kinetics CO4: understand the Principle of Conservation of Mechanical Energy (for conservative forces) and apply this law to problems of objects moving under the influence of conservative forces. CO5: develop ideas of Newtons Law of gravity, gravitational field and potential energy by solving various problems.
Electricity and Magnetism	CO1 : Comprehend basic concepts like: laws of electrostatics and magneto statics and also related applications. CO2 : Understand the interrelated concepts of Electricity and Magnetism.

	CO3 : Understand the working of transient circuits and alternating current circuits. CO4 : Correlate the theoretical basis of various concepts of electricity and magnetism while performing experiments.
Electromagnetic Theory – I	CO1: Apply vector calculus to understand concepts in electrostatics. CO2: Comprehend the interaction between charges in vacuum as well as in medium. CO3: Calculate the electric field and electrical potential for discrete charges and continuous distribution of charge. CO4: Apply suitable techniques to solve various electrostatic problems. CO5: Understand how ferroelectric materials can be used as memory devices.
Optics	CO1 : Understand the image formation for various optical systems. CO2 : Differentiate between optical phenomena like Interference, Diffraction and Polarization. CO3 : Correlate the theoretical basis of various concepts of Geometrical Optics and Physical Optics while performing experiments CO4 : Develop understanding towards the different phenomena exhibited by light.
Oscillations, Waves and Sound	CO1 : Set up an equation of motion for simple harmonic motion and obtain its solution. CO2 : Explain how superposition of waves leads to different Lissajous figures. CO3 : Set and solve the equation of motion for damped and driven damped harmonic oscillators and analyse the nature of oscillations. CO4: Understand the dependence of velocity of sound waves on various factors like temperature, pressure, density, humidity. CO5: Solve problems for different cases of Doppler effect.
Instrumentation	CO1 : Understand basic concepts related to the various types of measuring instruments and measuring techniques. CO2 : Comprehend basic principles involved in measuring

	instruments like Ammeter, Voltmeter, Ohmmeter and Multimeters. CO3 : Understand working and use of CROs and Signal Generators CO4 : Understand working and usage of the various types of transducers.
Quantum Mechanics	CO1 : understand central concepts and principles in quantum mechanics, such as the Schrödinger equation, the wave function and its statistical interpretation, the uncertainty principle, stationary and non-stationary states, time evolution of solutions. CO2 : solve the Schrödinger equation to obtain wave functions for some important types of potential in one and three dimension and give concise physical interpretations and reasoning underlying the mathematical results. CO3 : grasp the concepts of angular momentum and spin. CO4 : have an insight into fundamental issues in quantum mechanics like the EPR paradox, Bells theorem and Schrödinger's cat CO5: develop an understanding of why both analytic and numerical solutions are important in quantum mechanics and have acquired experience in using both types of methods on quantum mechanical problems CO6: use numerical tools and software to solve the Schrodinger equation for more complicated cases.
Properties of Matter and Acoustics	CO1 : Gain an introductory knowledge of dynamics of rigid bodies, and its applications to basic physical problems. CO2 : Familiarize with of acoustics of rooms and musical scales. CO3 : Comprehend the phenomenon of elasticity, surface tension, viscosity and their application.
Computational Physics	CO1 : Understand various numerical methods CO2 : Use FORTRAN language for numerical calculations. CO3 : Understand various concepts of Physics using numerical methods using FORTRAN as a programming language. CO4 : Solve problems in Physics by numerical methods using FORTRAN as a programming language.
Introduction to Error Analysis	CO1: the techniques involved in analyzing measurement data

	and the errors associated with themeasurement system used. CO2: the importance of knowing the uncertainty and nature of uncertainty that occurs during measurements CO3: the method of propagation of errors and applying it to estimate uncertainties. CO4: the method of statistical analysis in applying it to estimate uncertainties. CO5: several probability distribution functions like Gaussian distribution, Binomial distribution, and Poisson distribution. CO6: plotting of graphs and estimate the best fit lines through the data points.
Electromagnetic Theory – II	CO1 : Calculate magnetic field induction using Biot-Savart's law and Ampere's law. CO2 : Interpret bound currents and calculate magnetic fields in matter. CO3 : Comprehend microscopic theory magnetism. CO4 : Establish the link between electrostatics and magnetostatics using Maxwell's equations. CO5: Develop the wave equation for propagation of electromagnetic waves through material media and vacuum at different angles of incidence.
Solid State Physics	CO1 : Understand firmly the basics of Solid State Physics. CO2 : Understand the link between the structural aspects and the various physical properties of crystalline solids. CO3 : Gain a comprehensive broad knowledge in topic such as: Bonding in Solids, Crystal Physics, Electrical properties of solids, Origin of energy band structure in solids and Magnetic properties of materials.
Thermodynamics and Statistical Mechanics	CO1 : Understand basics of kinetic theory of gases and thermodynamic potentials. CO2 : Understand Maxwell-Boltzmann, Fermi-Dirac, and Bose-Einstein statistics and its application to the classical gas, electrons in a metal and blackbody radiation CO3 : Understand the specific heat of solids by invoking statistical mechanics.
Atomic and Molecular Physics	CO1 : solve the case of the hydrogen atom using the three dimension time-independent Schroedinger equation, identify atomic effect such as space quantization and interpret the wave functions and probability densities.

	CO2 : become familiar with the orbital, spin and total angular momentum of many electron atoms. CO3 : explain the observed dependence of atomic spectral lines on externally applied magnetic fields. CO4: grasp the physics of diatomic molecules, their electronic states, vibrations and rotations and their spectra. CO5: comprehend classical and quantum theory of Raman effect. CO6: develop analytical and computing skills through problem solving, and computer based exercises, which involve quantum mechanical
Nuclear and Elementary Particle Physics	CO1 : Understand the fundamental principles governing the basic properties of nuclei, nuclear structure and particle physics. CO2 : Able to solve elementary problems, relating theoretical predictions and measurement results, in nuclear and particle physics.
Introduction to Error Analysis	CO1: the techniques involved in analyzing measurement data and the errors associated with the measurement system used. CO2: the importance of knowing the uncertainty and nature of uncertainty that occurs during measurements CO3: the method of propagation of errors and applying it to estimate uncertainties. CO4: the method of statistical analysis in applying it to estimate uncertainties. CO5: several probability distribution functions like Gaussian distribution, Binomial distribution, and Poisson distribution. CO6: plotting of graphs and estimate the best fit lines through the data points.
Heat and Thermodynamics	CO1: Understand different types of temperature scales and relationship between different scales of temperature. CO2: Able to relate the effects of changes in temperature, pressure and volume on physical systems at macroscopic scale by analyzing collective motion of their particles. CO3: Able to comprehend the first law of thermodynamics to represent the relationship between heat and mechanical work.
Introduction Astronomy Astrophysics	CO1 : Understand the various Extra-galactic and objects. Astrophysics CO2 : Understand the construction, working and mounting of modern telescopes.

	CO3 : Understand coordinate system of Celestial Objects. CO4 : Understand types of stars and their life cycle.
Properties of Matter and Acoustics	CO1 : Gain an introductory knowledge of dynamics of rigid bodies, and its applications to basic physical problems. CO2 : Familiarize with of acoustics of rooms and musical scales. CO3 : Comprehend the phenomenon of elasticity, surface tension, viscosity and their application
Computational Physics	CO1 : Understand various numerical methods CO2 : Use FORTRAN language for numerical calculations. CO3 : Understand various concepts of Physics using numerical methods using FORTRAN as a programming language. CO4 : Solve problems in Physics by numerical methods using FORTRAN as a programming language.

Mathematics

Course Title	Course Outcome
Calculus	i) Assimilate the notions of limit of a sequence and convergence of a series of real numbers. ii) Calculate the limit and examine the continuity of a function at a point. iii) Understand the consequences of various mean value theorems for differentiable functions. iv) Sketch curves in Cartesian and polar coordinate systems. v) Apply derivative tests in optimization problems appearing in social sciences, physical sciences, life sciences and a host of other disciplines.
Algebra and Geometry	Understand the importance of roots of real and complex polynomials and learn various methods of obtaining roots. ii) Familiarize with relations, equivalence relations and partitions. iii) Employ De Moivre's theorem in a number of applications to solve numerical problems. iv) Recognize consistent and inconsistent systems of linear equations by the row echelon form of the augmented matrix, using rank. v) Find eigenvalues and corresponding eigenvectors for a square matrix.

	vi) Explain the properties of three dimensional shapes.
Multivariable Calculus	i) Learn conceptual variations while advancing from one variable to several variables in calculus. ii) Apply multivariable calculus in optimization problems. iii) Inter-relationship amongst the line integral, double and triple integral formulations. iv) Applications of multivariable calculus tools in physics, economics, optimization, and understanding the architecture of curves and surfaces in plane and space etc. v) Realize importance of Green, Gauss and Stokes' theorems in other branches of mathematics.
Ordinary Differential Equations	i) Understand the genesis of ordinary differential equations. ii) Learn various techniques of getting exact solutions of solvable first order differential equations and linear differential equations of higher order. iii) Know Picard's method of obtaining successive approximations of solutions of first order differential equations, passing through a given point in the plane and Power series method for higher order linear equations, especially in cases when there is no method available to solve such equations. iv) Grasp the concept of a general solution of a linear differential equation of an arbitrary order and also learn a few methods to obtain the general solution of such equations. v) Formulate mathematical models in the form of ordinary differential equations to suggest possible solutions of the day to day problems arising in physical, chemical and biological disciplines.
Real Analysis	i) Understand many properties of the real line R and learn to define sequence in terms of functions from R to a subset of R. ii) Recognize bounded, convergent, divergent, Cauchy and monotonic sequences and to calculate their limit superior, limit inferior, and the limit of a bounded sequence. iii) Apply the ratio, root, alternating series and limit comparison tests for convergence and absolute convergence of an infinite series of real numbers. iv) Learn some of the properties of Riemann integrable functions, and the applications of the fundamental theorems of integration.
Group Theory	i) Recognize the mathematical objects called groups. ii) Link the fundamental concepts of groups and symmetries of geometrical objects.

	iii) Explain the significance of the notions of cosets, normal subgroups, and factor groups. iv) Analyze consequences of Lagrange's theorem. v) Learn about structure preserving maps between groups and their consequences.
Probability and Statistics	i) Understand distributions in the study of the joint behaviour of two random variables. ii) Establish a formulation helping to predict one variable in terms of the other that is, correlation and linear regression. iii) Understand central limit theorem, which establish the remarkable fact that the empirical frequencies of so many natural populations, exhibit a bell shaped curve.
Mechanics	i) Familiarize with subject matter, which has been the single centre, to which were drawn mathematicians, physicists, astronomers, and engineers together. ii) Understand necessary conditions for the equilibrium of particles acted upon by various forces and learn the principle of virtual work for a system of coplanar forces acting on a rigid body. iii) Determine the centre of gravity of some materialistic systems and discuss the equilibrium of a uniform cable hanging freely under its own weight. iv) Deal with the kinematics and kinetics of the rectilinear and planar motions of a particle including the constrained oscillatory motions of particles. v) Learn that a particle moving under a central force describes a plane curve and know the Kepler's laws of the planetary motions, which were deduced by him long before the mathematical theory given by Newton.
Linear Algebra	i) Understand the concepts of vector spaces, subspaces, bases, dimension and their properties. ii) Relate matrices and linear transformations, compute eigen values and eigen vectors of linear transformations. iii) Learn properties of inner product spaces and determine orthogonality in inner product spaces. iv) Realise importance of adjoint of a linear transformation and its canonical form.
Partial Differential Equations and Calculus of Variations	i) Apply a range of techniques to solve first & second order partial differential equations. ii) Model physical phenomena using partial differential equations such as the heat and wave equations.

	iii) Understand problems, methods and techniques of calculus of variations.
Set Theory and Metric Spaces	i) Learn basic facts about the cardinality of a set. ii) Understand several standard concepts of metric spaces and their properties like openness, closedness, completeness, Bolzano Weierstrass property, compactness, and connectedness. iii) Identify the continuity of a function defined on metric spaces and homeomorphisms.
Advanced Algebra	i) Understand the basic concepts of group actions and their applications. ii) Recognize and use the Sylow theorems to characterize certain finite groups. iii) Know the fundamental concepts in ring theory such as the concepts of ideals, quotient rings, integral domains, and fields. iv) Learn in detail about polynomial rings, fundamental properties of finite field extensions, and classification of finite fields.
Tensors and Differential Geometry	i) Explain the basic concepts of tensors. ii) Understand role of tensors in differential geometry. iii) Learn various properties of curves including FrenetSerret formulae and their applications. iv) Know the Interpretation of the curvature tensor, Geodesic curvature, Gauss and Weingarten formulae. v) Understand the role of Gauss's Theorema Egregium and its consequences. vi) Apply problem-solving with differential geometry to diverse situations in physics, engineering and in other mathematical contexts.
Mathematical Logic	i) Learn the syntax of first-order logic and semantics of first-order languages. ii) Understand the propositional logic and basic theorems like compactness theorem, meta theorem and post-tautology theorem. iii) Assimilate the concept of completeness interpretations and their applications with special emphasis on applications in algebra.
Integral Transforms and Fourier Analysis	i) Know about piecewise continuous functions, Dirac delta function, Laplace transforms and its properties. ii) Solve ordinary differential equations using Laplace transforms. iii) Familiarise with Fourier transforms of functions belonging to $L_{\phi}R_{\alpha}$ class, relation between Laplace and Fourier transforms. iv) Explain Parseval's identity, Plancherel's theorem and

	applications of Fourier transforms to boundary value problems. v) Learn Fourier series, Bessel's inequality, term by term differentiation and integration of Fourier series. vi) Apply the concepts of the course in real life problems.
Linear Programming	i) Analyze and solve linear programming models of real life situations. ii) Provide graphical solutions of linear programming problems with two variables, and illustrate the concept of convex set and extreme points. iii) Understand the theory of the simplex method. iv) Know about the relationships between the primal and dual problems, and to understand sensitivity analysis. v) Learn about the applications to transportation, assignment and two-person zero-sum game problems.
Information Theory and Coding	i) Study simple ideal statistical communication models. ii) Understand the development of codes for transmission and detection of information. iii) Learn about the input and output of a signal via transmission channel. iv) Study detection and correction of errors during transmission. v) Represent a linear code by matrices - encoding and decoding.
Graph Theory	i) Appreciate the definition and basics of graphs along with types and their examples. ii) Understand the definition of a tree and learn its applications to fundamental circuits. iii) Know the applications of graph theory to network flows. iv) Understand the notion of planarity and coloring of a graph. v) Relate the graph theory to the real-world problems.
Special Theory of Relativity	i) Understand the basic elements of Newtonian mechanics including Michelson Morley experiment and geometrical interpretations of Lorentz transformation equations. ii) Learn about length contraction, time dilation and Lorentz contraction factor. iii) Study 4-dimensional Minkowskian space-time and its consequences. iv) Understand equations of motion as a part of relativistic mechanics. v) Imbibe connections between relativistic mechanics and electromagnetism.

Complex Analysis	i) Visualize complex numbers as points of $\mathbb{R}^3$ and stereographic projection of complex plane on the Riemann sphere. ii) Understand the significance of differentiability and analyticity of complex functions leading to the Cauchy Riemann equations. iii) Learn the role of Cauchy Goursat theorem and Cauchy integral formula in evaluation of contour integrals. iv) Apply Liouville's theorem in fundamental theorem of algebra. v) Understand the convergence, term by term integration and differentiation of a power series. vi) Learn Taylor and Laurent series expansions of analytic functions, classify the nature of singularity, poles and residues and application of Cauchy Residue theorem.
Numerical Analysis	i) Obtain numerical solutions of algebraic and transcendental equations. ii) Find numerical solutions of system of linear equations and check the accuracy of the solutions. iii) Learn about various interpolating and extrapolating methods. iv) Solve initial and boundary value problems in differential equations using numerical methods. v) Apply various numerical methods in real life problems.
Discrete Mathematics	i) Learn about partially ordered sets, lattices and their types. ii) Understand Boolean algebra and Boolean functions, logic gates, switching circuits and their applications. iii) Solve real-life problems using finite-state and Turing machines. iv) Assimilate various graph theoretic concepts and familiarize with their applications.
Wavelets and Applications	i) Know basic concepts of signals and systems. ii) Understand the concept of Haar spaces. iii) Learn Fourier transform and wavelet transform of digital signals. iv) Learn applications of wavelets to the real-world problems. v) Apply wavelets in signal processing and image processing.
Number Theory	i) Learn about some important results in the theory of numbers including the prime number theorem, Chinese remainder theorem, Wilson's theorem and their consequences. ii) Learn about number theoretic functions, modular arithmetic and their applications. iii) Familiarise with modular arithmetic and find primitive roots of prime and composite numbers. iv) Know about open problems in number theory, namely, the

	Goldbach conjecture and twin-prime conjecture. v) Apply public crypto systems, in particular, RSA.
Mathematical Finance	i) Understand financial markets and derivatives including options and futures. ii) Appreciate pricing and hedging of options, interest rate swaps and no-arbitrage pricing concepts. iii) Learn stochastic analysis, Ito's formula, Ito integral and the Black−Scholes model. iv) Study and use Hedging parameters, trading strategies and currency swaps.
C++Programming for Mathematics	i) Understand and apply the programming concepts of C++ which is important for mathematical investigation and problem solving. ii) Use mathematical libraries for computational objectives. iii) Represent the outputs of programs visually in terms of well formatted text and plots.
Cryptography	i) Understand the difference between classical and modern cryptography. ii) Learn the fundamentals of cryptography, including Data and Advanced Encryption Standards (DES & AES) and RSA. iii) Encrypt and decrypt messages using block ciphers, sign and verify messages using well-known signature generation and verification algorithms. iv) Know about the aspects of number theory which are relevant to cryptography.
Advanced Mechanics	i) Understand the reduction of force system in three dimensions to a resultant force acting at a base point and a resultant couple, which is independent of the choice of base of reduction. ii) Learn about a nul point, a nul line, and a nul plane with respect to a system of forces acting on a rigid body together with the idea of central axis. iii) Know the inertia constants for a rigid body and the equation of momental ellipsoid together with the idea of principal axes and principal moments of inertia and to derive Euler's equations of motion of a rigid body, moving about a point which is kept fixed. iv) Study the kinematics and kinetics of fluid motions to understand the equation of continuity in Cartesian, cylindrical polar and spherical polar coordinates which are used to derive Euler's equations and Bernoulli's equation. v) Deal with two-dimensional fluid motion using the complex potential and also to understand the concepts of sources, sinks,

	doublets and the image systems of these with regard to a line and a circle.

Chemistry

PROGRAMME SPECIFIC OUTCOMES (PSO)

PSO-1	Acquire the skills in preparation of chemical solutions, inorganic complexes, planning the procedures and performing experiments in the laboratory.
PSO-2	Handle scientific instruments like spectrophotometer, pH meter, Conductometer, Potentiometer, etc.
PSO-3	Develop basic theoretical principles of chemistry and writing skills applicable for higher studies and research
PSO-4	Operate efficiently within a group during their project and assignments and hence develop important skills such as communication, negotiation, influence, advising and interpreting
PSO-5	Appreciate the central role of chemistry in our society by understanding the safe handling of chemicals, environmental issues and key issues faced in energy, health and medicine.
PSO-6	Elucidate various spectra, X Ray Diffractograms, TG-DTA curves and identify surface morphology by SEM/TEM images.

Course Title	Course Outcome
General Physical and Inorganic Chemistry	CO1 : Demonstrate and evaluate the rate and order of a reaction. CO2 : Utilize mathematical concepts to solve chemical problems. CO3 : Develop expertise in the preparation of chemical solutions based on normality, molarity and molality. CO4 : Interpret the PV isotherms of gases and identify the critical temperature. CO5 : Delineate atomic structure, periodic table and covalent bonding. CO6 : Sketch hybridization and molecular orbital diagrams.
General Organic and Inorganic Chemistry	CO1 : Name the organic compounds using IUPAC nomenclature. CO2 : Identify and classify the different organic reactions. CO3 : Apply the theoretical knowledge to synthesize alkanes and alkenes.

	CO4 : Write 3D structures of organic molecules using 2D surface. CO5 : Identify the given unknown organic compound by carrying out various chemical tests.
Concepts in Physical and Analytical Chemistry	CO1: Describe the basic concepts of thermodynamics and its applications. CO2 : Interpret the pressure temperature diagrams in unary and binary systems. CO3 : Explain the concept of surface tension and viscosity in liquids. CO4 : Explain role of analytical chemistry in sciences, calculations based on chemical stoichiometry. CO5 : Sketch titration curves and solve numericals. CO6 : Explain theory on precipitation and complex formation titrations.
Concepts in Organic and Inorganic chemistry	CO1 : Categorize the compounds as aromatic, non- aromatic and anti-aromatic. CO2 : Apply the theoretical knowledge to write the synthesis of alkynes, alkyl halides, aromatic compounds. CO3 : Discuss and describe the steps involved in the mechanism of nitration, sulphonation, halogenation and Friedel Crafts reactions of aromatic compounds. CO4 : Explain and outline the different properties of transition elements. CO5 : Compare 4d and 5d analogues. CO6 : Describe crystalline solids in terms of their structure, ionic radii and coordination. CO7 : Interpret crystal structures. CO8 : Describe lattice energy, Born-Haber's cycle, Fajan's rule and defects in solids. CO9 : Explain trends in periodic properties of d-block elements with respect to their ionic radii, oxidation state, spectral properties, magnetic properties. CO10 : Describe crystalline solids in terms of their structure, ionic radii and coordination there by able to interpret crystal structure.

Comprehensive Chemistry-I (Physical & Inorganic Chemistry)	CO1 : Understand Second and Third law of Thermodynamics CO2 :Calculate equilibrium constant and formulate conditions for maximum yield in industrial processes CO3 : Explain theory of strong and weak electrolytes. CO4 : Explain trends in periodic properties of f-block elements with respect to its size of atoms or ions, reactivity, oxidation state, complex formation, colour, magnetic properties. CO5 : Name coordination compounds and to able to draw the structure based on its name. CO6 : Describe the shape and structures of coordination complexes based on different coordination numbers. CO7 : Explain merits and demerits of different theories of acids and bases and to explain the properties of a solvent that determines their utility.
Comprehensive Chemistry-II (Organic & Analytical Chemistry)	CO1 : Identify and classify diverse organic compounds containing C, H and O elements. CO2 : Predict the chemical reactivities of several organic compounds containing CHO elements. CO3 : Outline the preparations of several compounds belonging to different classes of organic compounds having CHO elements. CO4 : Apply the important reactions involved in each class of organic compounds with CHO elements. CO5 : Design scheme for an analytical process. CO6 : Use proper techniques of sampling of solids, liquids & gases. CO7 : Apply statistical treatment to analytical data.
Advanced Chemistry-I: Physical and Inorganic Chemistry	CO1: Understand the interactions of electromagnetic radiation and matter in IR and Raman spectroscopy and their applications. CO2 : Explain applications and harmful effects of nuclear radioisotopes. CO3 : Demonstrate a sound knowledge of the photochemistry principles and their application. CO4 : Employ the theories that govern metal ligand bonding. CO5 : Interpret the types of crystal field splitting and calculate the crystal field stabilization energy. CO6 : Discuss the types of d-d transitions and its theory.
Advanced Chemistry-II: Organic and Analytical chemistry	CO1 : Assess conditions for obtaining maximum efficiency of extraction. CO2 : Classify chromatographic methods. CO3 : Apply chromatographic method for separation, Qualitative and quantitative estimation.

	CO4 : Predict the stereochemistry of products for various reactions using the mechanisms involved in the course. CO5 : Explain the reactivity of organic compounds containing nitro, amino and cyano functional groups. CO6 : Name and classify the carbohydrates and analyze its chemical reactivities. CO7 : Name and classify the organosulfur and organophosphorous compounds and analyze its chemical reactivities. CO8 : Apply the important reactions involved for the synthesis of other similar compounds.
Name Reactions and Synthetic Methodologies	CO1 : Describe condensation reactions involving nucleophilic addition to carbonyl compounds. CO2 : Define and describe various name reactions and rearrangements along with their mechanisms. CO3 : Predict the product for various reactions involving these name reactions/rearrangements. CO4 : Apply these mechanisms towards the formation of complex molecules. CO5 : Discuss and describe the steps involved in the mechanism of Friedel-Crafts reactions, Reimer-Tiemann reaction, Vilsmeier-Haack reaction, Gattermann-Koch reaction and Kolbe-Schmidt reaction. CO6 : List the different oxidising and reducing agents. CO7 : Apply the theoretical knowledge to identify the reagents used to bring about a particular chemical reaction.
Surface Chemistry and Catalysis	CO1 : Understand the behavior of solid surfaces. CO2 : Differentiate between surface energy and surface tension in case of solids. CO3 : Classify and interpret various types of adsorption isotherms. CO4 : Estimate surface area of a solid. CO5 : Predict the mechanistic behavior of catalytic reactions. CO6 : Evaluate conditions under which a catalysed reaction changes rate dependence.
Bioinorganic Chemistry	CO1 : Elucidate the role of metal ions that are involved in different processes like oxygen transport, electron-transfer reactions etc. in biological systems. CO2 : Apply the concepts of coordination chemistry to metallobiomolecules which are based on iron and copper ions. CO3 : Evaluate the role of metal centres in the metalloenzymes

	that are involved in the catalysis of various biological reactions and thus predict the reaction mechanisms. CO4 : Develop skills to prepare model systems which mimic the role of metal ions in biological systems. CO5 : Discuss the importance of essential and trace elements in biological processes and evaluate their role in biology. CO6 : Explain the biologically important compounds like proteins, carbohydrates etc. and to interpret their biological importance. CO7 : Compare different mechanisms of ion transport across cell membrane and classify different biomolecules which help in the transport of ions and to illustrate PS-I and PS-II approach of photosynthesis. CO8 : Analyze how metals are used as diagnostic agents and application of Au, Cu, Zn, Pt-complexes as anti-cancer drug and in medicine.
Pharmaceutical Chemistry	CO1 : Understand the significance of chemistry in Pharmaceutical chemistry. CO2 : Develop an understanding of the physico-chemical properties of drugs. CO3 : Explain molecular mechanism of drug action and metabolism. CO4 : Draw comparison between medicinal chemistry and pharmaceutical chemistry. CO5 : Synthesize some of the important drugs reported in literature. CO6 : Identify and define the drug classes and some pharmacological properties.
Polymer and Colloid Science	CO1 : Distinguish between different types of solutions in terms of solute dimensions. CO2 : Evaluate properties of colloids. CO3 :.Explain properties of gels and emulsions. CO4 : Calculate molecular weight of a polymer. CO5 : Design synthesis of a polymer. CO6 : Measure molecular weight of a polymer. CO7 : Understand solid state properties of polymer
Spectroscopic Techniques	CO1 : Outline and interpret the deviation from Beer-Lambert's Law and to identify the validity and limitations. CO2: Interpret the spectroscopic methods for qualitative and quantitative analysis; discuss the Principle instrumentation; compare the Colorimeter and Spectrophotometer and employ

	UV-Visible Spectrophotometer. CO3: Outline the principle on which inductively coupled plasma spectroscopy works and illustrate the instrumentation involved in the technique. CO4: Employ inductively coupled plasma spectroscopy technique and identify its limitations.
Heterocyclic Chemistry	CO1 : Identify, name and classify the various heterocyclic compounds. CO2 : Describe the structure, different reactions and preparations of selected nitrogen and oxygen containing aliphatic heterocycles. CO3 : Describe the structure, diverse reactions and syntheses of pyrrole, furan, thiophene and pyridine heterocycles. CO4 : Describe the structure, diverse reactions and synthetic routes with mechanisms of numerous condensed heterocycles. CO5 : Predict the reactivities of complex heterocyclic compounds containing the structural motif of these simple heterocycles. CO6 : Apply the synthetic methodologies for the synthesis of complex heterocycles.
Nanomaterials and Solid State Chemistry	CO1 : Recall the history, occurrence and technological development of nanomaterials and classify them. CO2 : Compare different synthesis techniques of nanoparticles like biological, chemical and physical and design various nanomaterials. CO3 : Evaluate XRD data, and calculate its parameters; carry out analysis of TG-DTA curves; assess morphology and particle size from SEM/TEM images. CO4 : Express the physical and chemical properties of solids like magnetic, electrical and dielectric and interpret the applications of materials in various field like catalysis, ferrofluids, etc.
Organometallic Chemistry	CO1 : Illustrate metal-ligand interaction in formation of different metal carbonyls based on valence bond theory. CO2 : Explain and rationalize the synthesis structure, bonding, properties of organometallic compounds of main group elements. CO3 : Apply the EAN concept and Wade's rules to any organometallic system and predict its stability, structure and bonding. CO4 : Understand the chemical behavior and predict the reaction mechanism of organometallic compounds. CO5 : Illustrate the catalytic cycles using an organometallic compound as a catalyst for industrial synthesis of some organic

	compounds. CO6 : Interpret IR spectra of metal carbonyls and predict their structure.
Spectroscopic Methods in Organic Chemistry	CO1 : Describe the principles of IR, UV and Mass spectroscopy. CO2 : Calculate UV maxima of any given organic compound using Woodward-Fieser rules. CO3 : Predict the presence of various functional groups in a given organic compound using IR spectroscopy. CO4 : Interpret the mass spectra of various organic compounds. CO5 : predict the structures of organic compounds based on the given 1 H NMR and 13 CMR data. CO6 : interpret the 1 H NMR and 13 CMR spectra of organic compounds.
Environmental Chemistry	CO1 : Delineate how pollutants are transported and accumulated in the environment. CO2 : Recognize different types of toxic substances and analyze toxicology. CO3 : Describe water purification and wastetreatment processes. CO4 : Apply knowledge of chemical and biochemical Principles of fundamental environmental processes in air, water, and soil. CO5 : Apply basic chemical concepts to analyze chemical processes involved in different environmental problems. CO6 : Develop skills in procedures and few instrumental methods applied in analysis of soil and water pollution.
Selected Topics in Inorganic Chemistry	CO1 : Differentiate between thermodynamic stability and kinetic stability and apply it to transition metal complexes. CO2 : Apply the concepts to determine the reaction mechanism of transition metal complexes. CO3 : Determine the factors that govern the stability and lability of transition metal complexes. CO4 : Illustrate the chemistry and function of some of the technologically useful materials like liquid crystals, superconductors and fullerides. CO5 : Understand the properties and classify the polymers,CO6 : Explain the preparation, structure and bonding and applications of polymers comprising of B, P, Si and S. CO7 : Analyze the magnetic properties of the transition metal complexes as well as interpret the effect of temperature on magnetic properties. CO8 : Determine the magnetic susceptibility by using Guoy's balance.

	CO9 : Identify and apply the symmetry elements in molecules and to evaluate the Point groups in molecules with appropriate examples.

M.Sc Chemistry

Course Title	Course Outcome
General Inorganic Chemistry	
Fundamentals of Organic Chemistry	1. To enable students to identify the presence or absence of aromaticity in organic compounds. 2. To enable students to understand and apply various concepts in stereochemistry. 3. To enable students to propose plausible mechanism of organic reactions.
Analytical Techniques	1. To know the fundamentals of chromatographic separations. 2. To address modern challenges across the chemical, biological, and physical sciences and to isolate and examine chemical and biological species as pure substances.
Electro analytical Techniques- I	1. Comprehend the factors that must be controlled to obtain reliable and reproducible data from electro analytical experiments 2. Capable of identifying the most appropriate electro analytical technique for a specific analysis
Reaction Mechanisms in Organic Chemistry	To enable students to understand and propose plausible mechanism of organic reactions. 2. To enable students to choose appropriate reagents to carry out substitution reactions.
Topics in Physical Chemistry	1. Students will be able to understand the chemistry of the magnetic behaviour of materials. 2. Understand the chemistry of polymers and its applications.
Spectroscopy in Chemistry	1. Know the basic concepts in spectroscopy 2. Understand the different spectroscopic methods in chemistry
General Physical Chemistry	1. Students will be able to apply the knowledge of thermodynamics. 2. Students will be able to propose the mechanism of different reaction taking place in environment.

Electro analytical Techniques -II	1. Understand the basic concepts of potentiometry and electrodes. 2. Understand what physical or chemical properties of a material can be studied with the commonly used electroanalytical techniques.
Environmental Control and Chemical Analysis	1. To enable students to identify the sources, effects and propose control methods of various types of pollution. 2. To enable students to describe the analysis of greenhouse gases, pesticides, explosives, cosmetics and paints.
Reagents in Organic Synthesis	1. To enable students to choose appropriate oxidizing agent for oxidation of a particular functional group. 2. To enable students to choose appropriate reducing agent for reduction of a particular functional group.
Diffraction Methods	Students will be in a position to interpret the XRD spectra.
Separation Techniques	1. To be able to describe the methods of separation and its application. 2. To be able to acquire technical knowledge of, and some practical experience with, analyses in gas and liquid chromatography, and in capillary electrophoresis
Spectral Methods of Analysis	1. Students will be able to understand the basics of emission, diffraction concepts. 2. Understand the different phenomenon of emission occurring in organism.
Q A and Q C in Analytical Chemistry	1. To enable students to understand the basics of quality control and quality assurance 2. To enable students to describe the types of packaging and regulatory aspects in food and pharmaceutical industries
Bio analytical Chemistry	It will provide valuable training for students whose career goals include forensic, biotechnology.
Calibrations and Validation	Student will understand the qualification of laboratory equipments as a precondition of reliable analytical testing
Techniques in Chemical Analysis	1. To develop an understanding of the range and theories of instrumental methods available in analytical chemistry. 2. To provide theoretical knowledge in selected instrumental methods of analysis
Applied Analytical Chemistry	1. Students will learn about the basic concepts used in clinical chemistry.

	2. Students will be able to understand the chemistry of food and will be able to analyse different components in it.

Geology

PROGRAMME SPECIFIC OUTCOMES (PSO)

PSO-1	Explain the theoretical concepts involved in courses like Mineralogy, Petrology and Structural Geology.
PSO-2	Apply theoretical concepts involved in mineral forming to confidently identify them in hand as well as in thin sections.
PSO-3	Analyse the theoretical concepts and apply them in interpreting the various petrographic features in rocks exhibited in hand specimens and in thin sections.
PSO-4	Create, analyse and interpret structural geological maps.
PSO-5	Make good field observations during field excursions and relate their understanding of various structural and petrological features learnt in classroom for correct interpretation.
PSO-6	Communicate confidently and write geological reports.
PSO-7	Demonstrate content knowledge appropriate to professional career goals

Course Title	Course Outcome
Fundamentals Of Mineralogy	CO1 Understand what is a mineral and its formation. CO2 Explain mineralogical properties like polymorphism, isomorphism, Pseudomorphism. CO3 Describe the physical properties of minerals. CO4 Relate crystal chemistry and chemical bonding to the formation of minerals like crystal structure, chemistry, chemical composition. CO5 Compare and contrast the elemental and major oxide composition of the crust with the entire earth. CO6 Link how the internal atomic structure of minerals affects the external development of a crystal in terms of crystal symmetry, crystal system and crystal forms. CO7 Identify rock- forming minerals in hand specimen using their physical properties.

	CO8 Classify minerals into crystal systems based on crystal symmetry.
Earth's Dynamics And Tectonics	CO1 Understand the origin and nature of the earth and its layered structure. CO2 Gain insights into the spheres of the earth and their inter-relationship, the earth's Gravity, and magnetic field. CO3 Relate the concept of Isostacy with plate tectonics. CO4 Differentiate between the different types of forces acting in the lithosphere and link the different types of responses of brittle and ductile substances to stress. CO5 Understand the exogenous and endogenous geological hazards. CO6 Read and interpret geological maps and draw geological cross – sections. CO7 Recognize different types of folds, faults and joints.
Elementary Petrology	CO1 Understand the processes involved in the formation of rocks, their textures and structures. CO2 Classify rocks into their various types – Igneous, Sedimentary or Metamorphic. CO3 Understand the importance of rocks. CO4 Differentiate between the different rock types based on their textures, structures and mineralogy. CO5 Identify the different textures and structures of rocks. CO6 Describe the mineralogy and properties of, and identify common rock types.
Principles Of Stratigraphy And Paleontology	CO1 Understand principles of Stratigraphy and concept of Facies. CO2 Differentiate between absolute and relative age of the earth. CO3 Explain measurements of geologic time. CO4 Describe how rocks are correlated. CO5 Describe types of fossils, conditions and modes for fossilisation, how fossils can be used to locate economic deposits. CO6 Describe and explain morphology of the hard parts of different phylum's and geological time range. CO7 Understand map reading and handle clinometer compass. CO8 Solve problems on bearings. CO9 Describe and identify fossils/casts/shells w.r.t their morphology and geological age CO10 Apply classroom teaching to field observations and preparing a geological report.

Advanced Mineralogy And Geochemistry	CO1 Understand the concept of Gibbs Phase Rule. CO2 Correlate structure, chemical composition with physical and optical properties of minerals of major silicate group of minerals. CO3 Interpret stability relations of minerals using Phase diagrams. CO4 Understand how minerals originate and associate with each other in a rock CO5 Understand the geochemical composition of the earth. CO6 Describe how compatible elements are involved in the various geochemical processes. CO7 Explain how incompatible elements are involved in the various geochemical processes. CO8 Evaluate and interpret how geochemistry can be used to interpret tectonic setting. CO9 Solve applied quantitative problems. CO10 Plot major oxides in tectonic discriminant diagrams
Physical Geology	CO1 Identify the dominant medium of erosion, transportation and deposition in a given area and explain the mechanisms for those processes. CO2 Identify various dessert landforms and explain the processes involved in their formation. CO3 Identify various fluvial landforms and explain the processes involved in their formation. CO4 Identify various Karst topography and features and explain the processes involved in their formation. CO5 Identify various glacial and coastal landforms and explain the processes involved in their formation. CO6 Assign stream order as per Strahler's Method, Analyze various attributes of basin morphometry and drainage. CO7 CO8 Prepare and analyze long and cross sections of river profiles from SOI Toposheet. Deduct the processes involved in shaping the geomorphology of a local area by an integrated approach of applying theoretical knowledge and field based observations.
Groundwater And Hydrogeology	CO1 Understand the concept of Groundwater, its sub- surface distribution and sources. CO2 Explain the rock properties of porosity and permeability affecting the movement of groundwater. CO3 Differentiate between the various types of aquifers. CO4 Carry out groundwater exploration by resistivity method.

	CO5 Draw flow-nets from groundwater levels. CO6 Determine water quality based on various parameters. CO7 Understand the effects of over withdrawal of groundwater and waterlogging, and suggest mitigation measures.
Ore Genesis	CO1 Differentiate between rock-forming minerals and ore minerals. CO2 Understand the basis of classifying ore minerals. CO3 Understand the origin and stages of ore formation. CO4 Classify the various ore minerals under categories such as magmatic, hydrothermal, volcanogenic etc. CO5 Explain the processes involved in the formation of ore deposits. CO6 Understand the genesis and occurrence of various ore deposits in India. CO7 Evaluate ore minerals in hand specimen using their physical properties.
Marine Geology	CO1 Understand ocean bathymetry and learn to identify features of the ocean floor such as mid ocean ridges, seamounts, guyots, hydrothermal vents, pillow basalts, trenches. CO2 Relate the ocean features to its tectonic origin. CO3 Understand the various processes which generate ocean currents. CO4 Classify marine sediments into four broad categories based on their origin i.e lithogenous , hydrogeneous, biogenous, cosmogenous. CO5 Identify the characteristics of important marine resources for the future such as polymetallic nodules and gas hydrates. CO6 Recognise how near shore geological processes shape coastlines over time
Structural Geology	CO1 Gather knowledge about the geometry of various structures acquired by rocks at primary and secondary stages. CO2 Understand the concepts of stress and strain. CO3 Understand the application of stress and strain in rock deformation. CO4 Identify rock structures and deformities like joints, folds and faults. CO5 Understand a structural separation in geological context based on unconformities. CO6 Identify secondary structures developing in rocks. CO7 Interpret geological maps

	CO8 Solve structural problems based on provided data.
Engineering Geology	CO1 Understand issues related to geological basement and structure of a region. CO2 Identify the characteristics of basement rock formations and problems associated with them. CO3 Describe and interpret geological structures in geological maps and drawing cross sections. CO4 Assess the area appropriately suggested for a geotechnical project and apply the geological knowledge for a safe and secure construction and operation of a geotechnical project. CO5 Suggest remedial measures to encounter the problems detected. CO6 Interpret core logs and suggest suitable remedial measures. CO7 Collect data interpret and analyse it to solve problems associated with the engineering project as well as the environment. CO8 Explore and suggest novel ideas using geological background for the geotechnical project. CO9 Suggest Site feasibility based on geological maps. CO10 Carry out physical and mineralogical descriptions of cores. CO11 Draw relationship of core log to RQD values CO12 Compute reservoir area, catchment area, reservoir capacity. CO13 Solve numerical problems on ultimate strength of rocks
Optical Mineralogy	CO1 Understand basic concepts in optical mineralogy wrt relief, pleochroism, character between crossed polars, extinction and their types, interference colours, zoning and twinning. CO2 Correlate elementary principles of optics to crystal optics. CO3 Distinguish Uniaxial and Biaxial Indicatrix CO4 Understand the concept of formation of Interference colours and determine their orders as per Newton's Scale. CO5 Handle Petrological Microscopes. CO6 Identify major rock-forming minerals in microsections. CO7 Detect Optic Sign for Uniaxial and Biaxial Minerals using Interference Figures. CO8 Determine Anorthite content of Plagioclase. CO9 Calculate Optic Axial Angle.
Natural Hazards And Management	CO1 Understand the causes, effects and mitigation measures for natural hazards such as droughts, floods, cyclones, volcanic eruptions, tsunami, landslides & subsidence, salinity hazards, coastal erosion. CO2 Appreciate the CRZ act and its impact on disaster mitigation. CO3 Understand the framework and roles of various bodies under

	the National disaster management plan of India. CO4 Prepare a simple disaster management plan for a building/unit.
Geotectonics	CO1 Gain an insight into the study of the earth's interior using seismic data. CO2 Understand the various layers of the earth's interior and the mechanism of plate tectonics. CO3 Explain the origin and nature of the earth's magnetic field and palaeomagnetism. CO4 Understand the theory of Continental Drift along with supporting evidences. CO5 Explain mountain building (orogenesis) and its relation with plate tectonics. CO6 Identify and plot various tectonic features on the earth's surface.
Sedimentary Petrology	CO1 Understand the processes leading to the formation of sedimentary rocks. CO2 Identify and explain the various textures and structures of sedimentary rocks. CO3 Relate different sedimentary facies with the environment of deposition. CO4 Describe and identify the textures, structures and mineral composition and origin of various clastic and non-clastic sedimentary rocks
Precambrian Stratigraphy Of India	CO1 Understand evolution and stabilisation of the Archean cratons in India with special emphasis on Dharwar craton. CO2 Understand the tectonics behind Mobile Belts of India CO3 Differentiate between western Dharwar Craton and Eastern Dharwar Craton. CO4 Interpret geological and geochemical differences of the basement rocks for Sargur (Gorur Gneiss) and Dharwarian (Peninsular Gneissic Complex) CO5 Relate the lithostratigraphy of Sargur and Dharwar Schist Belt and correlate it with the Goa Group of rocks. CO6 Understand the Purana basins in India with emphasis on Cuddapah Vindhyans and Kaladgis. CO7 Identify specimens representing rock Formations in Goa CO8 Assigning stratigraphy Formations based on fossils. CO9 Solve problems in stratigraphic correlation
Petroleum Geology	CO1 Describe the Physical & chemical properties of

	Hydrocarbons. CO2 Compare various exploration techniques involved in hydrocarbon detection. CO3 Understand the process of drilling & completion of a Petroleum well. CO4 Prepare isopach maps. CO5 Delineate and describe the petroliferous domains in India. CO6 Analyse well logs.
Metamorphic Petrology	CO1 Understand metamorphism and their upper and lower limits and study metamorphic concepts like factors, types of metamorphism and facies. CO2 Apply fundamental principles of metamorphism to development of textures. CO3 Classify metamorphic rocks based on mineral assemblage and fabric. CO4 Relate the types of metamorphism with the product. CO5 Represent metamorphic rocks graphically using Phase Diagrams. CO6 Correlate deformation with grade of metamorphism. CO7 Evaluate how the different factors like temperature, pressure, protolith, chemically active fluids and time control metamorphism. CO8 Interpret tectonic setting of Metamorphic Belts based on field characters and kinematic stress indicators. CO9 Interpret the metamorphic processes combining the evidences derived from hand specimens, microsections and protolith. CO10 Differentiate between Barrovian and Buchan Zones CO11 Apply the facies concept to progressive contact and regional including burial metamorphism. CO12 Identify textures of metamorphic rocks in hand specimens. CO13 Identify textures, structures, mineralogy of metamorphic rocks in thin sections
Remote Sensing And Digital Image Processing	CO1 Explain remote sensing principles, purposes, advantages and limitations. CO2 Define and describe electromagnetic spectrum and interactions with various types of media. CO3 Describe characteristics of remote sensing imagery. CO4 Describe sensors and image acquisition methods. CO5 Search and download satellite imagery from online portals such as Bhuvan, USGS Earth explorer. CO6 Understand the application of digital imagery for interpretation of lithology, Structure and geomorphology CO7 Prepare various maps using Quantum GIS and Google Earth.

Igneous Petrology	CO1 Understand conceptual techniques wrt nucleation and growth of minerals thereby understanding the formation of a rock. CO2 Identify igneous rocks in hand specimen. CO3 Identify igneous rocks in thin sections CO4 Classify igneous rocks CO5 Evaluate a rock wrt its environment of formation (PT) conditions thereby assign a name. CO6 Identify key textural and microstructures and their application related to geological processes. CO7 Interpret ternary phase diagrams. CO8 Classify rocks based on their chemical analysis.
Phanerozoic Stratigraphy Of India	CO1 Understand the Gondwana sedimentation and its economic significance. CO2 Understand the geology and geotectonics of Triassic of Spiti. CO3 Understand the geology and geotectonics of Jurassic of Kutch. CO4 Understand the geology and geotectonics of Cretaceous of Trichinopoly. CO5 Understand Deccan Flood Volcanism. CO6 Analyse and interpret the Gondwana breakup. CO7 Understand the geology and geotectonics of Tertiaries of Assam and its economic significance. CO8 Understand the upheaval and evolution of Himalayas. CO9 Relate boundary problems associated with Precambrian-Cambrian, Permian-Triassic, Cretaceous-Tertiary and Pleistocene-Holocene boundaries in India and their relation to mass extinctions. CO10 Prepare lithostratigraphic maps.
Rock Structures And Deformation Microstructures	CO1 Understand the process and mechanisms of rock structures and rock deformation microstructures. CO2 Interpret the significance of microstructures in Igneous, Sedimentary and Metamorphic rocks. CO3 Apply the significance of features like foliation and lineation in field as well as in microsections in understanding microstructures and rock deformation. CO4 Interpret Shear Sense Indicators in Mylonites. CO5 Enhance application skills in relating deformation history to tectonism. CO6 Interpret deformation features in field and in microsections. CO7 Identify and Interpret the significance of rock structures in thin sections. CO8 Identify and Interpret the significance of rock deformation

	microstructures in thin sections.
Surveying, Mapping And Field Geology	CO1 Carry out dumpy level survey. CO2 Carry out plane table survey. CO3 Understand SOI Toposheet catalogue. CO4 Learn to plan for a geology field trip. CO5 Record detailed field observations systematically in their field diary and subsequently prepare a geologic field report of the same
Principles Of Geophysical Exploration And Mining	CO1 Gain knowledge of key concepts of mining processes right from exploration to exploitation CO2 Understand the difference between the nature of, and factors leading to the choice between, Open-cast and Underground mining methods. CO3 Explain the different techniques of ore beneficiation. CO4 Get acquainted with government agencies and regulations that control the mining and mineral conservation processes. CO5 Explain the principles behind, and methods of Geophysical, Geochemical and Geobotanical exploration. CO6 Draw cross - and longitudinal sections using bore-hole Data. CO7 Estimate ore reserves using different methods. CO8 Get a first-hand experience in core-logging

Botany

PROGRAMME SPECIFIC OUTCOMES (PSO)

PSO-1	Recognize all forms of lower plants (Algae, Fungi, Bryophytes, Pteridophytes),higher plants (Gymnosperm and Angiosperm) and interpret/ predict their Phylogenetic linkages.Illustrate distinct features.
PSO-2	Recognize cell organelles and bio molecules including enzymes, Predict and interpret their significances in cell metabolism/functioning and Pathways.
PSO-3	Apply physiological mechanism of plants to analyze synthesis of valuable plant products (Primary/ Secondary) with economic potential and health effects through the field of Horticulture.
PSO-4	Analyze the techniques and working principles of Instruments used in Botanical studies and apply the knowledge in Basic and applied Plant research (Microbiology, Plant Physiology, plant breeding,

	Fungi, Plant Tissue Culture, Plant Genetic Engineering, Ecology, plant drug technology. etc.) through bio statistical parameters.
PSO-5	Analyze applications of online biological database, data handling in plant drug discovery and interactions.
PSO-6	Appraise student's knowledge in Botany including fundamental basis of all living organisms (Plant and Microbes) and applying the same in sustainable usage of resources for the quality human survival on planet earth and protect environment.

Course Title	Course Outcome
Plant diversity	CO1: Recognise and understand the evolutionary aspects of different plant groups of lower plants. CO2: classify lower plants. CO3: describe the lower plant groups. CO4: sketch the morphology and anatomy of selected lower plants.
Cell Biology & Biomolecules	CO1: Recognise, classify cell, explain cell theory, evolution and biogenesis CO2: Define, describe, classify and explain Cytoskeleton, cell organelle, biomolecules CO3: Define, describe, compare, explain, illustrate cell wall and plasma membrane CO4: Predict and interpret the importance of cell organelles and biomolecules in cell functioning
Plant Anatomy and Embryology	CO1: Define, describe and explain the basic plant anatomical and embryological features CO2: Compare the interrelatedness of organ-systems and their functions CO3: Examine the features through histological techniques. CO4: Define, describe, explain, compare theories in organization of tissues
Microbiology	CO1: appraise the student knowledge to fundamental basis of all living microbes and their interaction with the environment. CO2: Apply the knowledge of microbial world towards the sustainable usage of resources for the quality human survival on the planet Earth.

Physiology of Plants	CO1: Analyse Physiological processes in plants. CO2: Formulate and design experiments to analyse and interpret data. CO3: Learn to describe the processes through practicals and mini projects. CO4: Estimate and evaluate methods of quantitation of pigments, enzymes and metabolites.
Cytogenetics	CO1: To restate fundamentals of genetics CO2: To identify different stages of cell division. CO3: To construct chromosome maps. CO4: To review the effects of mutagens on seed germination.
Plant MolecularBiology	CO1: Outline, memorize and express process of central dogma CO2: Estimate and evaluate methods of quantitation of macromolecules CO3: Understand molecular basis of life CO4: Learn and demonstrate basic molecular technique of DNA isolation and separation through electrophoresis.
Genetic Engineering	CO1: Apply the basic knowledge of Plant Genetic Engineering in research CO2: Perform experiments by themselves CO3: Compare and assess the different DNA Sequencing techniques CO4: Design experiments in plant genetics
Ecology & Conservation	CO1: To discuss role and importance of biotic and abiotic environment factors in the sustenance of plant life CO2: To analyze the pollution scenario of the area. CO3: To estimate the oxygen and Carbon dioxide from different water samples. CO4: To evaluate and determine minimum area of sampling unit (using quadrat) For the study of local vegetation.
Techniques And Instrumentation in Botany	CO1: Learn the Principle and working of techniques And instruments used in Botanical research CO2: Analyze the research problem and formulate the methodology for carrying out research/experiment CO3: Examine various parameters before setting up an experiment CO4: Apply the knowledge in further studies and research in Botany
Enzymes and metabolic pathways	CO1: To identify the role of enzymes in various biological processes CO2: To classify the different enzymes based on its structure

	CO3: To restate the various mechanisms of enzyme action
Plant Breeding and Biostatistics	CO1: To recognise various techniques in plant breeding CO2: To differentiate between modes of plant breeding CO3: To employ manual emasculation procedure. CO4: To calculate mean, median, mode, standard deviation, std. error for provided material.
Systematics of Flowering plants and Phylogeny	CO1: Name, arrange, describe and compare the taxa CO2: Outline keys for identification of flowering plants CO3: Interpret phylogenetic trees, cladograms, etc.
Plant pathology	CO1: Identify various diseases and causal agents of economically important plants CO2: Find effective control measures
Horticulture, Floriculture & Landscaping	CO1: Explain the basics of Horticulture, floriculture and landscaping CO2: Outline the requirements for building up nurseries, garden, etc. CO3: Inculcate the technique of vegetative propagation of plants. CO4: Identify and relate the scope of these fields in building up career
Bioinformatics	CO1: Explain basics of bioinformatics, biological,databases CO2: Compare and contrast protein information resources and genome information resources CO3: Relate the theoretical knowledge with practical sessions. Enable data handling and analysis. CO4: Compare the homology between different biological species.
Plant Drug Technology and Pharmacognosy	CO1: Explain, discuss and classify medicinal plants, plant drug and technology CO2: Explain and illustrate, biosynthetic pathways,bioassays and working of instruments CO3: Discuss and compare methods of extraction and analysis of phytochemicals.
Organic Farming	CO1: Create awareness of the social, economic and environmental context for current and future organic agriculture production and management CO2: Assess the importance of organic foods in todays World. CO3: Apply the knowledge in becoming an entrepreneur in Organic Farming.

Plant tissue culture	CO1: Explain and discuss the general theoretical backgrounds and practical techniques CO2: Describe, define, explain/ discuss, compare, concept of differentiation and culture types CO3: Define, describe, explain/ discuss, techniques in PTC in media preparation,sterilisation, callus culture and organogenesis CO4: Describe, explain, discuss applications in forestry, agriculture etc
Economic Botany	CO1: To identify economically important plants /plant parts CO2: To identify valuable plant products of potential market and economic value. CO3: To evaluate, describe and create awareness of the uses of natural plant products as alternative to synthetic and chemical products
Applied Mycology	CO1: To explain techniques involved in sampling, culturing and maintaining fungal cultures. CO2: To discuss applications of fungi.

Biochemistry

Course Title	Course Outcome
Molecules Of Life	CO1: Gain an understanding of the various theories of the origin of life CO2: Comprehend the importance of water in the sustenance of life. CO3: Compare and contrast the various different biomolecules (carbohydrates, proteins, lipids, nucleic acids, vitamins), their categories as well as functions. CO4: Understand and apply general laboratory safety measures as well as calculate for preparation of various chemicals for experiments. CO5: Prepare different solutions such as buffers, reagents and stock solutions for experiments independently.
Cell Biology	CO1: Demonstrate an understanding of cell communication CO2: Correlate the function of each cell organelle with proper coordination. CO3: Identify and analyze different biological cells using a compound microscope

	CO4: Prepare various plant and animal specimen for the observation of cell structures.
Protein Chemistry	CO1: Comprehend the various levels of protein structure CO2: Explain the mechanism and significance of membrane proteins. CO3: Correlate the techniques used in studying protein structure CO4: Review enzymes and their classification system. CO5: Assess and compare the various methods employed in protein estimation/concentration and measuring the protein content.
Biophysics	CO1: Explain the basic concepts of the origin and evolution of life CO2: Understand how cellular reactions take place in accordance with thermodynamic principles CO3: Describe the mechanism of the derivation of energy through bioenergetic reactions in living cells CO4: Elucidate energy transductions in organisms. CO5: Understand the concepts of buffer capacity and osmolarity. CO6: Demonstrate a practical understanding of spectrophotometry.

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