

Bachelor of Science (Computer Science)

Programme Code -04UGR003

PROGRAMME EDUCATIONAL OBJECTIVES

- Analyze, design and create computing solutions for scientific and multidisciplinary challenges.
- Pursue a successful career in industry/academia/research/government driven by strong foundations and in-depth domain knowledge and contribute to the sphere as a competent professional.
- Demonstrate an exceptional involvement and active participation in Research and Development leading to new innovations and optimized solutions.
- Engage in lifelong learning with persistent scientific temper for professional advancement and effective communication of the technical information.
- Work effectively in multi-disciplinary and multi-cultural environments by respecting professionalism and ethical practices within organization and society at national and international level.
- To prepare graduates who will be successful professionals in industry, government, academia, research, entrepreneurial pursuit and consulting firms
- To prepare graduates who will achieve peer-recognition; as an individual or in a team; through demonstration of good analytical, research, design and implementation skills

PROGRAMME-SPECIFIC OUTCOMES (PSO)

- **PSO 1:** Apply knowledge of recent computing technologies, skills and current tools of computer science.
- **PSO 2:** Ability to design and conduct experiments, as well as to analyze and interpret data.
- **PSO 3:** Knowledge of contemporary research issues in the different areas of computer science.
- **PSO 4:** Ability to explore research gaps, analyze and carry out research in the specialized/emerging areas.
- **PSO 5:** Design software systems, components, or processes to meet identified needs within economic, environmental and social constraints.
- **PSO 6:** Ability to express/present ideas in an impressive and professional manner.
- **PSO 7:** Recognize the need to engage in lifelong learning through continuing education and research.
- **PSO 8:** Ability to work in multidisciplinary and multicultural environment.
- **PSO 9:** Ability to become entrepreneur based upon societal needs.
- **PSO 10:** An understanding of professional, social and ethical responsibilities.

PROGRAM OUTCOMES (PO)

- **PO 1.** Ability to acquire and apply in-depth knowledge in the area of Computer Science and contribute to the state-of-art.
- **PO 2.** Ability to Conduct Experiments, as well as analyze & Interpret Data.
- **PO 3.** Ability to understand a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, ethical, manufacturability, and sustainability.
- **PO 4.** An ability to function, manage and lead multidisciplinary teams.
- **PO 5.** Ability to identify, formulate & solve problems, conduct research and critically examine the outcomes and take corrective actions.
- **PO 6.** An understanding of professional and ethical responsibility.
- **PO 7.** An ability to communicate effectively.
- **PO 8.** To understand the impact of engineering solutions in a global, economic, environmental, and societal context.
- **PO 9.** A recognition of the need for, and an ability to engage in life-long learning.
- **PO 10.** A knowledge of contemporary issues.
- **PO 11.** An ability to use the techniques, skills and modern engineering tools necessary for practice.

Course Code: 3CBCA201

Course Name: BASIC COMPUTER & INFORMATION TECHNOLOGY-I

Course Objective

- To educate students to analyze, design, integrate & manage information systems using information technology.

Course Outcome

- Student will be able to use computer system easily and they will get knowledge about how to use different type of operating system.

Course Code: 3HBHL101

Course Name: HINDI BHASHA AUR SANRACHNA

पाठ्यक्रम के उद्देश्य

- विद्यार्थियों में राष्ट्र प्रेम की भावना का विकास करना।
- हिन्दी के समृद्ध साहित्य को नयी पीढ़ी तक पहुँचाना।
- पत्र-लेखन, सार लेखन, भाव पल्लवन एवं साक्षात्कार के कौशल का विकास करना।

- डायरी,संस्मरण, लेखन, पारिभाषिक, शब्दावली, तत्सम, तद्भव, देशज, विदेशी शब्दों इत्यादि के ज्ञान का परिमार्जन करना।

अपेक्षित परिणाम

- विद्यार्थी भारत भूमि से प्रेम व स्नेह के भावों को बढ़ा सकेंगे।
- विद्यार्थियों की हिन्दी की शब्द संपदा में वृद्धि होगी।
- पत्र-लेखन,सार लेखन, भाव पल्लवन साक्षात्कार के कौशल का विकास होगा।
- डायरी एवं संस्मरण लेखन विद्या का परिमार्जन होगा।
- हिन्दी के समृद्ध साहित्य कोश से लाभान्वित होंगे।

Course Code: 3SBPH103

Course Name: Physics-I (Mechanics, Oscillations and Properties of Matter)

Course Objective

- To understand applications of Newton's Laws of Classical System.
- Understand the concepts of elasticity and viscosity.
- Understand the damped and driven oscillators.
- Gains and appreciations of surface phenomena.

Course Outcomes

- To study the fundamentals of mechanics and oscillations.
- Gate the knowledge about forces help the student in their daily life.
- The information will teach the students about the rolling concepts.

Course Code: 3SBCS104

Course Name: FUNDAMENTAL OF COMPUTING

Course Objectives

- To familiar student world of information technology, components of computer system,.
- To understand concept of software and hardware.
- To understand the use of office automation tool and various operating system.
- To familiar student with world wide web and create web pages using HTML and front page

Course Outcomes

After the completion of the course student are able to:-

- Easy interact with computer world.
- Known the memory hierarchy of computer.
- Create and execute web pages.

Course Code: 3SBMA105

Course Name: Mathematics – I (Algebra, Trigonometry & Geometry)

Course Objective

- Apply the concepts of matrices in solving a system of linear equations.
- Be familiar with the theory of equations.
- Expand trigonometric functions and also find the summation of T-series.
- To have knowledge about Cone and Cylinder with conicoides.
- Be familiar with group theory, ring, integral domain, field and make their fundamental strong.

Course Outcomes

- Understanding the ideas of matrices and ability to solve system of linear equations.
- The student will be able to acquire sound knowledge of matrices and techniques in solving equations with the help of theory of equations
- Fluency in solving equations.
- Understanding the concepts of algebra, trigonometry and geometry.

Course Code: 3HBEL201

Course Name: ENGLISH LANGUAGE AND INDIAN CULTURE

Course Objective

- To Study the basic concept and Language Skills of English Language.
- Comprehensive study of different kinds of vocabulary in English Language.
- To Study the different era in every story and moods in poems.

Course Outcome

- Students will be able to understand the basic concept and Language Skills of English Language.
- Students will be able to understand the different use of vocabulary in their sentences.
- Students will be able to understand the varieties of stories on different issues and on different format.

Course Code: 3MBFE101

Course Name: FUNDAMENTALS OF ENTREPRENEURSHIP

Course Objective

- Understanding basic concepts of entrepreneurship and key steps in the elaboration of business ideas, Developing personal creativity and entrepreneurial initiative.

Course Outcomes

- Understanding basic concepts in the area of entrepreneurship, understanding the stages of the entrepreneurial process, adopting of the key steps in the elaboration of business ideas, Developing personal creativity and entrepreneurial initiative.

Course Code: 3SBPH203

Course Name: PHYSICS-II (MATHEMATICAL BACKGROUND, ELECTROSTATICS AND STEADY)

Course Objective

- The main objective of this subject is introducing the basic concepts of Electrostatics to student and help in developing problem solving skills.
- Student will study basic ideology of Scalar and Vector product, double and triple integral.
- Introducing the basic concepts of electrostatics to student and help in developing problem solving skills.

Course Outcome

- To study the basics of Mathematical Background and to introduce concepts of Electrostatics and magnetics.

Course Code: 3SBCS204

Course Name: PROGRAMMING WITH C

Course Objective

- The course is designed to provide complete knowledge of C language.
- Students will be able to develop logics which will help them to create programs, applications in C.
- Also by learning the basic programming constructs they can easily switch over to any other language in future.

Course Outcomes

- Prepared as a complete knowledge of C language.
- Apply to develop logics which will help them to create programs, applications in C.
- Prepared as basic programming constructs and they can easily switch over to any other language

Course Code: 3SBMA205

Course Name: MATHEMATICS – II (Calculus, Differential Equations & Vector Calculus)

Course Objective

- To solve problem using expansion of functions.
- Familiar with curve tracing.
- Apply integral calculus in solving problems.
- To make the student acquire sound knowledge of techniques in solving differential equations.
- Familiar with physical interpretation of divergence and curl of a vector.

Course Outcomes

- Understanding the ideas and concept of calculus and facility in solving standard examples.
- Fluency in integration using standard methods, including the ability to find an appropriate method for a given integral.
- Fluency in solving differential equations and facility in solving standard examples.
- Understanding the ideas of vector calculus and facility in solving standard examples.

Course Code: 3HBHL302

Course Name: HINDI BHASHA SAMVEDNA AVAM SANCHAR SADHAN

पाठ्यक्रम के उद्देश्य

- विद्यार्थियों को भारतीय संवेदना, संस्कृति, वैश्विक चेतना से परिचित कराना
- धर्म, दशम, नयाय, नीति,साहित्य की प्राचीन व नवीन मान्यताओं से परिचित करवाना
- सांचार संसाधनों से परिचित करवाना
- सिनेमा, रंगमंच,संगीत, चित्रकला इत्यादि से परिचित करवाना

अपेक्षित परिणाम

- विद्यार्थि आधुनिक संचार संसाधनों के प्रयोग में कुशल हो सकेंगे
- भारत की धर्म,दशम , नीति,संस्कृति, सीयता, संसकारों इत्यादि के प्रति ज्ञान प्राप्त कर कुशल एवं स्वेदनशील नागरिक बन सकेंगे

Course Code: 3HBHL302

Course Name: BASIC INFORMATION COMPUTER TECHNOLOGY- II

Course Objective

- To educate students to analyze, design, integrate & manage information systems using information technology.

Course Code: 3SBPH303

Course Name: PHYSICS-III (Kinetic Theory of Gases, Thermo-dynamics and Statistical Mechanics)

Course Objective

- To express the basic assumption of the kinetic theory of gases.
- Students learn the different laws of thermodynamics.
- To learn Thermodynamically function and their relations.

Course Outcomes

- Understand the concept of Thermodynamics and their laws.
- Describe the Thermodynamics function and their relations.
- Student learn about the concepts of Quantum Statics.

Course Code: 3SBCS304

Course Name: DATA STRUCTURE

Course Objective

- To introduce the fundamental concept of data structures and to emphasize the importance of data structures in developing and implementing efficient algorithms.
- In addition, another objective of the course is to develop effective software engineering.
- Practice, emphasizing such principles as decomposition, procedural abstraction, and software use.

Course Outcomes

- Knowledge of fundamental concept of data structures and to apply importance of data structures in developing and implementing efficient algorithms.
- Development of effective software engineering.

Course Code: 3SBMA305

Course Name: MATHEMATICS-III (Calculus, Differential Equation and Mechanics)

Course Objective

- The goal of this course is for students to gain proficiency in calculus computations.
- To make the student acquire sound knowledge of sequences, series and their convergence.
- To familiarize the student with Laplace and inverse Laplace transforms as well as applications of Laplace transformation in solving linear differential equations.
- To acquaint the student with mechanics.

Course Outcomes

- Understanding the ideas of sequences and series and ability to find their convergence.
- Understanding of the ideas of limit and continuity and an ability to calculate with them and apply them for function of one and two variables.
- Understanding of the ideas of differential equation and facility in solving standard examples.
- Understanding the ideas of Laplace and inverse Laplace transforms facility in solving standard examples and apply them.
- Understanding of the ideas of Mechanics and facility in solving simple standard examples.

Course Code: 3HBEL402

Course Name: ENGLISH LANGUAGE AND SCIENTIFIC TEMPER

Course Objective

- To Study the basic language skills (speaking, listening, reading, and writing) and grammar.
- Comprehensive study of different kinds of letters and applications.
- To study the different kinds of prose and poetry.

Course Outcome

- Student will be able to understand correct use of grammar and language skills.
- Student will be familiar with different prose and poetry.
- Student should be able to write analytically in a variety of formats, including essays, report writing and application.

Course Code: 3HBHP401

Course Name: HUMAN VALUES AND ETHICS

Course Objectives

- To help students understand the basic guidelines, content and process of Human value and value crisis in contemporary Indian Society.
- To help students understand the meaning of happiness and prosperity for a human being.
- To help students reflect critically on gender violence.
- To facilitate the students to understand harmony at all the levels of human living, and live accordingly.

Course Outcomes

On completion of this course, the students will be able to:

- Understand the significance of value inputs in a classroom and start applying them in their life and profession.
- Understand the value of harmonious relationship based on trust and respect in their life and

profession.

- Students will develop a sense of appreciation of women in all walks of life.
- Understand the role of a human being in ensuring harmony in society

Course Code: 3SBPH403

Course Name: Physics-IV (Group Waves, Acoustics and Optics)

Course Objective

- To aware the students about various phenomena of Waves, Acoustics and Optics.
- Describe the phenomena like Interference, Diffraction.

Course Outcomes

- Understand the Physics behind various optical phenomena.
- Understand various natural phenomena which is happening in their surroundings.
- Explain the relationship in between various optical phenomena.

Course Code: 3SBCS404

Course Name: INTRODUCTION TO DATABASE

Course Objective

- This course offers lecture, laboratory, and online interaction to provide a foundation in data management concepts and database systems.
- It includes representing information with the relational database model, manipulating data with an interactive query language (SQL) and database programming, database development including internet applications, and database security, integrity and privacy issues.

Course Outcomes

- Knowledge of fundamental concept of data structures and to apply importance of data structures in developing and implementing efficient algorithms.
- Development of effective software engineering.

Course Code: 3SBMA405

Course Name: MATHEMATICS-IV (Advanced Calculus, Partial Differential Equations, Complex Analysis and Abstract Algebra)

Course Objective

- The goal of this course is for students to gain proficiency in computations of advanced calculus.
- To make the student acquire sound knowledge of techniques in solving partial differential

equations.

- To familiarize the student with complex analysis.
- To acquaint the student with Abstract Algebra.

Course Outcomes

- Understanding the ideas of advanced calculus and series and an ability to calculate with them and apply them.
- Understanding of the ideas of partial differential equations and facility in solving standard examples.
- Understanding of the ideas of complex analysis and ability to calculate with them.
- Improved facility in abstract algebra.

Course Code: 3SBES501

Course Name: ENVIRONMENTAL STUDIES

Course Objective

- Student will be able to become proficient in the natural and physical sciences, as well as to be aware of social and cultural influences upon environmental problems facing society today.

Course Outcome

- The Environmental Studies minor supplements other majors to facilitate students' understanding of complex environmental issues from a problem-oriented, interdisciplinary perspective.
- Enable the student to acquire basic ideas about environment and emerging issues about environment problems.
- Aware about the need and importance of Natural Resources.
- Develop knowledge and understanding of the environment and enable the students to contribute towards maintaining and improving the quality of the environment.

Course Code: 3HBEL501

Course Name: INTRODUCTION TO SOFT SKILL & TEAM BUILDING

Course Objective

By the end of the soft skills training program, the students should be able to:

- Develop effective communication skills (spoken and written).
- Develop effective presentation skills.
- Conduct effective business correspondence and prepare business reports which produce results.
- Become self-confident individuals by mastering inter-personal skills, team management

skills, and leadership skills.

- Develop all-round personalities with a mature outlook to function effectively in different circumstances.
- Develop broad career plans, evaluate the employment market, identify the organizations to get good placement, match the job requirements and skill sets.
- Take part effectively in various selection procedures adopted by the recruiters.

Course Outcome

- The teaching methods in the soft skills training include lectures, projects, role plays, quizzes, and various other participatory sessions. The emphasis will be on learning by doing.
- Since the method of training is experiential and highly interactive, the students imbibe the skills and attributes in a gradual and subtle way over the duration of the program. The students will not only learn the skills and attributes but also internalize them over a period of time.
- Internalization ensures that the skills and attributes become part of the students' nature. Subtle changes are bound to occur in their behavior and outlook, and these will make them more self-assured and confident. Moreover, the behavior changes will be gradual and natural and will not appear artificial or put on. Thus, the changes in them will be genuine and positive.
- The Soft Skills training program is a credit course and the evaluation of the students takes place on a continuous basis. Active participation in activities, interest displayed by the students in acquiring the necessary attributes and skills and the commitment
- shown by them to improve in terms of attitudes are the main criteria for evaluation.

Course Code: 3SMPH503

Course Name: Discipline Specific Elective-I Physics-V (QUANTUM MECHANICS, ATOMIC, MOLECULAR AND NUCLEAR PHYSICS)

Course Objective

- To introduce student to the concept of special relativity and its application to physical sciences.
- To express the basic postulates of Quantum Mechanics and Atomic Physics.

Course Outcome

- Explain the nature of Quantum Mechanics and Lorentz Transformation equations.
- Understand the concept of constant relative motion of different bodies in different frames of references.
- Describe theories explaining the structure of atoms and the origin of the observed spectra.

Course Code: 3SMPH504

Course Name: Discipline Specific Elective-II Physics-V (ASTRO PHYSICS & ATMOSPHERIC SCIENCE)

Course Objective

- To gain knowledge of modern techniques, theory and observation results in astrophysics and cosmology.
- Introduce the physics of planetary atmospheres with special emphasis on the atmosphere of the earth.

Course Outcomes

Students will have understanding of:

- To understand binary stars as well as our solar system and the associated processes occurring in the Milky Way and other galaxies.
- To describe the basic structure of an atmosphere and the climate system.
- The concept of potential temperature and how it relates to static stability.
- Know the components of the earth radiation balance and understand optical depth and transmission function.
- Derive a simple model of “green house effect”.

Course Code: 3SBCS501

Course Name: DISCIPLINE SPECIFIC ELECTIVE – I CS - VI (OPERATING SYSTEM)

Course Objectives

- To understand the concept of Operating System.
- To understand the basics of memory management in computer systems.
- Able to understand the disc scheduling processes.

Course Outcomes

After completion of this course the students will be able –

- To learn what is operating system and how it makes computers work.
- To know how operating system manages complexity through appropriate abstraction of CPU, memory, files, semaphores etc.
- To get knowledge about different components of operating system like Process Management, Concurrency mechanisms, Deadlock handling, Memory Management techniques, Virtual Memory, File System and Secondary Storage Management, Security & protection etc.

Course Code: 3SBCS502

Course Name: DISCIPLINE SPECIFIC ELECTIVE – II CS - VI (COMPUTER NETWORK)

Course Objective

- Recognize the concepts and principles of operating systems.
- Provide comprehensive introduction to understand the underlying principles, techniques and approaches which constitute a coherent body of knowledge in operating systems.
- teach understanding how the various elements that underlie operating system interact and provides services for execution of application software.

Course Outcomes

- Identify basic components of operating system.
- Conceptualize synchronization amongst various components of a typical operating system.
- Understand and simulate activities of various operating system components.
- Correlate basic concepts of operating system with an existing operating system.

Course Code: 3SBMA503

Course Name: Discipline Specific Elective-I Mathematics-V (REAL ANALYSIS, LINEAR ALGEBRA & DISCRETE MATHEMATICS)

Course Objective

- The goal of this course is for students to gain proficiency in computation of real analysis.
- To make the student acquire sound knowledge of linear algebra.
- To familiarize the student with discrete mathematics.

Course Outcomes

- Understanding the ideas of real analysis and series and an ability to calculate with them.
- Understanding of the ideas of linear algebra and facility in solving standard examples.
- Understanding of the ideas of discrete mathematics and facility in solving standard examples.

Course Code: 3SBMA504

Course Name: Discipline Specific Elective-II Mathematics-V (RING THEORY AND LINEAR ALGEBRA - II)

Course Objective

- The goal of this course is for students to gain proficiency in computation of linear algebra.
- To make the student acquire sound knowledge of linear algebra.
- To familiarize the student with discrete mathematics.

Course Outcomes

- Understanding the ideas of Boolean algebra and ability to calculate with them.
- Understanding of the ideas of graph theory and facility in solving standard examples.
- Understanding of the ideas of discrete mathematics and facility in solving standard examples.

Course Code: 3SMPH603

Course Name: Discipline Specific Elective-I Physics-VI (SOLID STATE PHYSICS, ELECTRONICS AND LASER)

Course Objective

- Describe the difference between crystalline and non crystalline materials.
- Describe the arrangements of atoms and ions in crystalline structure.
- Explain basic Laser principle Laser behavior properties of Laser radiations, different types of Lasers and Laser applications.

Course Outcomes

- Demonstrate an understanding of the crystal lattice and how the main lattice types or described.
- Explain different laser used and make a comparison between them.

Course Code: 3SMPH604

Course Name: Discipline Specific Elective-II Physics-VI (NANO-TECHNOLOGY AND MATERIAL SCIENCE)

Course Objective

- To give comprehensive exposures to the students regarding various materials, crystalline, non – crystalline materials, crystal structure and their defects the concept of phase and different type of phase diagram.
- Experimental and computational characterization of nano-materials.

Course Outcomes

Students will have understanding of:

- Different type of materials and their structure.
- Structure dependence of various thermal, optical and mechanical properties.
- Explain the fundamental principles of nano-technology and their application to medical science.

Course Code: 3SBCS501

Course Name: DISCIPLINE SPECIFIC ELECTIVE – I CS VI- DIGITAL ELECTRONICS

Course Objectives

- To study various number systems, knowledge of these number systems is essential in core computer science subjects.
- To explore brief idea about the different digital circuits which are used to develop the digital devices.
- Understand the concepts of Memories, Programmable Logic Devices & Digital ICs.
- To motivate the students to develop their logic to design new digital circuits usable for hardware design.
- To motivate our students to use these digital circuits in integrated circuit design using VLSI.

Course Outcome

After completion of this course, students will be able to:

- Acknowledge about the fundamentals of digital circuit design.
- Understand the operation of Latch circuits & Flip flops.
- Take interest to designing & develop ICs in VLSI industries.
- Learn operation of different Semiconductor Memories

Course Code: 3SBCS502

Course Name: DISCIPLINE SPECIFIC ELECTIVE – II CS - VI (R-PROGRAMMING)

Course Objectives

- Provide students with an enhanced base of knowledge in current and reflective practice necessary to support a career in data analytics at advanced professional level.
- Understanding concept R programming data analytics.

Course Outcome

- On completion of this unit the student should be able to build project and can data analytics by using R programming.

Course Code: 3SBMA603

Course Name: Discipline Specific Elective-I Mathematics-VI (METRIC SPACE, NUMERICAL ANALYSIS & STATISTICS)

Course Objective

- To introduce the concept of metric space to the students and to make them understand various familiar concept of real analysis with the help of metric space.

- To introduce the concept of compactness and connectedness w.r.t. metric space and to study some useful properties of continuous function.
- To introduce various numerical techniques to the students of solving equation and also introduce the concept of numerical differentiation and integration.

Course Outcomes

- The concept of metric space would help them to generalize this notion on some other spaces.
- The idea of compactness and connectedness would help them to work on some other useful properties of sets and continuous function.
- The techniques of numerical solution of equation of different kind (algebraic/differential/integral) would help them to find the solution of practical problems.

Course Code: 3SBMA604

Course Name: Discipline Specific Elective-II Mathematics-VI (Fuzzy Set Theory)

Course Objective

- To introduce the basic types and concepts of fuzzy sets.
- To introduce different operations on fuzzy sets.
- To introduce the concept of fuzzy arithmetic.
- To introduce the concept of fuzzy relation.
- To introduce the concept of fuzzy relation equations.

Course Outcome

On completion of this course students will be able to:

- Understand the basic concept of Fuzzy sets.
- Apply the operations on Fuzzy sets.
- Solve the Fuzzy arithmetic.
- Understand the Fuzzy relations and Fuzzy relation equations.

Bachelor of Science (Mathematics)

Programme Code: 04UGR001

PROGRAMME EDUCATION OBJECTIVE (PEO'S)

The structure of the B.Sc. (Mathematics) Programme is designed to produce graduates of Maths subjects with rigorous practical, analytical and research based skills, who are exceptionally well-equipped to go onto Bachelor in Mathematics, or employment in industrial, academic and the B.Sc. (Mathematics) programme provides:

- **PEO's-1:** Apply the concepts of matrices in solving a system of linear equations.
- **PEO's-2:** Be familiar with the theory of equations.
- **PEO's-3:** Expand trigonometric functions and also find the summation of T-series.
- **PEO's-4:** To have knowledge about Cone and Cylinder with coincides.
- **PEO's-5:** Be familiar with group theory, ring, integral domain, field and make their fundamental strong.
- **PEO's-6:** To solve problem using expansion of functions.
- **PEO's-7:** Familiar with curve tracing.
- **PEO's-8:** Apply integral calculus in solving problems.
- **PEO's-9:** To make the student acquire sound knowledge of techniques in solving differential equations.
- **PEO's-10:** The goal of this course is for students to gain proficiency in calculus computations.
- **PEO's-11:** To make the student acquire sound knowledge of sequences, series and their convergence.
- **PEO's-12:** To familiarize the student with Laplace and inverse Laplace transforms as well as applications of
- **PEO's-13:** Laplace transformation in solving linear differential equations.
- **PEO's-14:** To introduce the Basic concept of Fuzzy Sets.
- **PEO's-15:** To introduce types of Fuzzy relation.
- **PEO's-16:** To be familiar with operations on Fuzzy Sets Fuzzy arithmetic.
- **PEO's-17:** To understand the solution method specific fields.

PROGRAMME OUTCOMES(PO'S)

- **PO's-1:** Understanding the ideas of matrices and ability to solve system of linear equations.
- **PO's-2:** Understanding the concepts of algebra, trigonometry and geometry
- **PO's-3:** Fluency in integration using standard methods, including the ability to find an appropriate method for a given integral.
- **PO's-4:** Fluency in solving differential equations and facility in solving standard examples.

PROGRAMME SPECIFIC OUTCOMES (PSO's)

- **PSO's-1:** The techniques of numerical solution of equation of different kind (algebraic/differential/integral)
- **PSO's-2:** would help them to find the solution of practical problems.
- **PSO's-3:** To understand the solution method
- **PSO's-4:** Enhancing the advance concepts.
- **PSO's-5:** Updation with relevant scenario in field of Mathematics, especially jobs in research centre. Critical thinking of a problem

Course Code: 3BCA201

Course Name: BASIC COMPUTER & INFORMATION TECHNOLOGY-I

Course Objective

- To educate students to analyze, design, integrate & manage information systems using information technology.

Course Outcome

- Student will be able to use computer system easily and they will get knowledge about how to use different type of operating system.

Course Code: 3HBHL101

Course Name: HINDI BHASHA AUR SANRACHNA

पाठ्यक्रम के उद्देश्य

- विद्यार्थियों में राष्ट्र प्रेम की भावना का विकास करना।
- हिन्दी के समृद्ध साहित्य को नयी पीढ़ी तक पहुँचाना।
- पत्र-लेखन, सार लेखन, भाव पल्लवन एवं साक्षात्कार के कौशल का विकास करना।
- डायरी, संस्मरण, लेखन, पारिभाषिक, शब्दावली, तत्सम, तद्भव, देशज, विदेशी शब्दों इत्यादि के ज्ञान का परिमार्जन करना।

अपेक्षित परिणाम

- विद्यार्थी भारत भूमि से प्रेम व स्नेह के भावों को बढ़ा सकेंगे।
- विद्यार्थियों की हिन्दी की शब्द संपदा में वृद्धि होगी।
- पत्र-लेखन, सार लेखन, भाव पल्लवन साक्षात्कार के कौशल का विकास होगा।
- डायरी एवं संस्मरण लेखन विद्या का परिमार्जन होगा।
- हिन्दी के समृद्ध साहित्य कोश से लाभान्वित होंगे।

Course Code: 3SBPH103

Course Name: Physics-I (Mechanics, Oscillations and Properties of Matter)

Course Objective

- To understand applications of Newton's Laws of Classical System.
- Understand the concepts of elasticity and viscosity.
- Understand the damped and driven oscillators.
- Gains and appreciations of surface phenomena.

Course Outcomes

- To study the fundamentals of mechanics and oscillations.
- Gain the knowledge about forces help the student in their daily life.
- The information will teach the students about the rolling concepts.

Course Code: 3SBCH 104

Course Name: Chemistry-I (Physical, Inorganic & Organic chemistry)

Course Objective

- To develop an understanding on the basics of mathematical concept, gaseous, liquid and colloidal states.
- To understand chemical kinetics, structure bonding and stereochemistry.

Course Outcomes

- The knowledge gained on mathematical concepts, liquid state, chemical kinetics, structure & bonding and stereochemistry will provide a strong platform to understand the concepts on these subjects for further learning

Course Code: 3SBMA105

Course Name: Mathematics – I (Algebra, Trigonometry & Geometry)

Course Objective

- Apply the concepts of matrices in solving a system of linear equations.
- Be familiar with the theory of equations.
- Expand trigonometric functions and also find the summation of T-series.
- To have knowledge about Cone and Cylinder with coincides.

Course Outcomes

- Understanding the ideas of matrices and ability to solve system of linear equations.
- The student will be able to acquire sound knowledge of matrices and techniques in solving equations with the help of theory of equations

- Fluency in solving equations.
- Understanding the concepts of algebra, trigonometry and geometry.

Course Code: 3HBEL201

Course Name: English Language And Indian Culture

Course Objective

- To Study the basic concept and Language Skills of English Language.
- Comprehensive study of different kinds of vocabulary in English Language.
- To Study the different era in every story and moods in poems.

Course Outcome

- Students will be able to understand the basic concept and Language Skills of English Language.
- Students will be able to understand the different use of vocabulary in their sentences.
- Students will be able to understand the varieties of stories on different issues and on different format.

Course Code: 3MBFE101

Course Name: Fundamentals of Entrepreneurship

Course Objective

- Understanding basic concepts of entrepreneurship and key steps in the elaboration of business ideas, Developing personal creativity and entrepreneurial initiative.

Course Outcomes

- Understanding basic concepts in the area of entrepreneurship, understanding the stages of the entrepreneurial process, adopting of the key steps in the elaboration of business ideas, Developing personal creativity and entrepreneurial initiative.

Course Code: 3SBPH203

Course Name: Physics-II (MATHEMATICAL BACKGROUND, ELECTROSTATICS AND STEADY)

Course Objective

- The main objective of this subject is introducing the basic concepts of Electrostatics to student and help in developing problem solving skills.
- Student will study basic ideology of Scalar and Vector product, double and triple integral.
- Introducing the basic concepts of electrostatics to student and help in developing problem solving skills.

Course Outcome

- To study the basics of Mathematical Background and to introduce concepts of Electrostatics and magnetics.

Course Code: 3SBCH 204**Course Name: Chemistry –II (PHYSICAL, INORGANIC & ORGANIC CHEMISTRY)****Course Objective**

- Study of Chemical bonding, Noble gases, S-block and P-block element. Brief discussion of Arenes and Aromaticity, cycloalkenes, dienes and alkynes.

Course Outcome

- Upon successful completion of this course, students will understand theories of chemical bonding and determine the molecular geometry of molecules using VSEPR theory. Understand the general and physical properties of matter.

Course Code: 3SBMA205**Course Name: Mathematics – II (Calculus, Differential Equations & Vector Calculus)****Course Objective**

- To solve problem using expansion of functions.
- Familiar with curve tracing.
- Apply integral calculus in solving problems.
- To make the student acquire sound knowledge of techniques in solving differential equations.
- Familiar with physical interpretation of divergence and curl of a vector.

Course Outcomes

- Understanding the ideas and concept of calculus and facility in solving standard examples.
- Fluency in integration using standard methods, including the ability to find an appropriate method for a given integral.
- Fluency in solving differential equations and facility in solving standard examples.
- Understanding the ideas of vector calculus and facility in solving standard examples.

Course Code: 3HBHL302

Course Name: Hindi Bhasha Samvedna Avam Sanchar Sadhan

पाठ्यक्रम के उद्देश्य

- विद्यार्थियों को भारतीय संवेदना, संस्कृति, वैश्विक चेतना से परिचित कराना।
- धर्म, दर्शन, न्याय, नीति, साहित्य की प्राचीन व नवीन मान्यताओं से परिचित करवाना।
- संचार संसाधनों से परिचित करवाना।
- सिनेमा, रंगमंच, संगीत, चित्रकला इत्यादि से परिचित करवाना।

अपेक्षित परिणाम

- विद्यार्थी आधुनिक संचार संसाधनों के प्रयोग में कुशल हो सकेंगे।
- भारत की धर्म, दर्शन, नीति, संस्कृति, सभ्यता, संस्कारों इत्यादि के प्रति ज्ञान प्राप्त कर कुशल एवं संवेदनशील नागरिक बन सकेंगे।

Course Code: 3HBHL302

Course Name: Basic Information Computer Technology- II

Course Objective

- To educate students to analyze, design, integrate & manage information systems using information technology.

Course Outcome

- Student will be able to use computer system easily and they will get knowledge about how to use different type of operating system.

Course Code: 3SBPH303

Course Name: Physics-III (Kinetic Theory of Gases, Thermo-dynamics and Statistical Mechanics)

Course Objective

- To express the basic assumption of the kinetic theory of gases.
- Students learn the different laws of thermodynamics.
- To learn Thermodynamically function and their relations.

Course Outcomes

- Understand the concept of Thermodynamics and their laws.
- Describe the Thermodynamics function and their relations.

- Student learn about the concepts of Quantum Statics.

Course Code: 3SBCH404

Course Name: Chemistry –III (physical, inorganic & organic CHEMISTRY)

Course Objective

- Study of efficiency and terms as well as thermodynamic process, spectrum, transition elements and coordination compounds

Course Outcomes

- Upon successful completion of this course, students will understand kinetics, equilibrium, Lech atelier's principle, acid and base reactions, pH, buffers, colligative properties, and electrochemical applications in an undergraduate laboratory.
- Understand the first law of thermodynamics and the role of energy and enthalpy in chemical reactions and perform thermochemical calculations.

Course Code: 3SBMA305

Course Name: Mathematics-III (Calculus, Differential Equation and Mechanics)

Course Objective

- The goal of this course is for students to gain proficiency in calculus computations.
- To make the student acquire sound knowledge of sequences, series and their convergence.
- To familiarize the student with Laplace and inverse Laplace transforms as well as applications of Laplace transformation in solving linear differential equations.
- To acquaint the student with mechanics.

Course Outcomes

- Understanding the ideas of sequences and series and ability to find their convergence.
- Understanding of the ideas of limit and continuity and an ability to calculate with them and apply them for function of one and two variables.
- Understanding of the ideas of differential equation and facility in solving standard examples.
- Understanding the ideas of Laplace and inverse Laplace transforms facility in solving standard examples and apply them.
- Understanding of the ideas of Mechanics and facility in solving simple standard examples.

Course Code: 3HBEL402

Course Name: English Language and Scientific Temper

Course Objective

- To Study the basic language skills (speaking, listening, reading, and writing) and grammar.
- Comprehensive study of different kinds of letters and applications.
- To study the different kinds of prose and poetry.

Course Outcome

- Student will be able to understand correct use of grammar and language skills.
- Student will be familiar with different prose and poetry.
- Student should be able to write analytically in a variety of formats, including essays, report writing and application.

Course Code: 3HBHP401

Course Name: Human Values and Ethics

Course Objectives

- To help students understand the basic guidelines, content and process of Human value and value crisis in contemporary Indian Society.
- To help students understand the meaning of happiness and prosperity for a human being.
- To help students reflect critically on gender violence.
- To facilitate the students to understand harmony at all the levels of human living, and live accordingly.

Course Outcomes

On completion of this course, the students will be able to:

- Understand the significance of value inputs in a classroom and start applying them in their life and profession.
- Understand the value of harmonious relationship based on trust and respect in their life and profession.
- Students will develop a sense of appreciation of women in all walks of life.
- Understand the role of a human being in ensuring harmony in society

Course Code: 3SBPH403

Course Name: Physics-IV (Group Waves, Acoustics and Optics)

Course Objective

- To aware the students about various phenomena of Waves, Acoustics and Optics.
- Describe the phenomena like Interference, Diffraction.

Course Outcomes

- Understand the Physics behind various optical phenomena.
- Understand various natural phenomena which is happening in their surroundings.
- Explain the relationship in between various optical phenomena.

Course Code: 3SBCH404

Course Name: Chemistry-IV (PHYSICAL, INORGANIC& ORGANIC CHEMISTRY)

Course Objective

- This subject make students learn about the bonding and properties and transition element coordination compounds

Course Outcomes

- Upon successful completion of this course students will describe the bonding and properties of transition and inter transition element coordination compounds

Course Code: 3SBMA405

Course Name: Mathematics-IV (Advanced Calculus, Partial Differential Equations, Complex Analysis and Abstract Algebra)

Course Objective

- The goal of this course is for students to gain proficiency in computations of advanced calculus.
- To make the student acquire sound knowledge of techniques in solving partial differential equations.
- To familiarize the student with complex analysis.
- To acquaint the student with Abstract Algebra.

Course Outcomes

- Understanding the ideas of advanced calculus and series and an ability to calculate with them and apply them.
- Understanding of the ideas of partial differential equations and facility in solving standard examples.
- Understanding of the ideas of complex analysis and ability to calculate with them.
- Improved facility in abstract algebra.

Course Code: 3SBES501

Course Name: Environmental Studies

Course Objective

- Student will be able to become proficient in the natural and physical sciences, as well as to be aware of social and cultural influences upon environmental problems facing society today.

Course Outcome

- The Environmental Studies minor supplements other majors to facilitate students' understanding of complex environmental issues from a problem-oriented, interdisciplinary perspective.
- Enable the student to acquire basic ideas about environment and emerging issues about environment problems.
- Aware about the need and importance of Natural Resources.
- Develop knowledge and understanding of the environment and enable the students to contribute towards maintaining and improving the quality of the environment.

Course Code: 3HBEL501

Course Name: Introduction to Soft Skill & Team Building

Course Objective

By the end of the soft skills training program, the students should be able to:

- Develop effective communication skills (spoken and written).
- Develop effective presentation skills.
- Conduct effective business correspondence and prepare business reports which produce results.
- Become self-confident individuals by mastering inter-personal skills, team management skills, and leadership skills.
- Develop all-round personalities with a mature outlook to function effectively in different circumstances.
- Develop broad career plans, evaluate the employment market, identify the organizations to get good placement, match the job requirements and skill sets.
- Take part effectively in various selection procedures adopted by the recruiters.

Course Outcome

- The teaching methods in the soft skills training include lectures, projects, role plays, quizzes, and various other participatory sessions. The emphasis will be on learning by doing.
- Since the method of training is experiential and highly interactive, the students imbibe the

skills and attributes in a gradual and subtle way over the duration of the program. The students will not only learn the skills and attributes but also internalize them over a period of time.

- Internalization ensures that the skills and attributes become part of the students' nature. Subtle changes are bound to occur in their behavior and outlook, and these will make them more self-assured and confident. Moreover, the behavior changes will be gradual and natural and will not appear artificial or put on. Thus, the changes in them will be genuine and positive.
- The Soft Skills training program is a credit course and the evaluation of the students takes place on a continuous basis. Active participation in activities, interest displayed by the students in acquiring the necessary attributes and skills and the commitment shown by them to improve in terms of attitudes are the main criteria for evaluation.

Course Code: 3SMPH503

Course Name: Discipline Specific Elective-I Physics-V (QUANTUM MECHANICS, ATOMIC, MOLECULAR AND NUCLEAR PHYSICS)

Course Objective

- To introduce student to the concept of special relativity and its application to physical sciences.
- To express the basic postulates of Quantum Mechanics and Atomic Physics.

Course Outcome

- Explain the nature of Quantum Mechanics and Lorentz Transformation equations.
- Understand the concept of constant relative motion of different bodies in different frames of references.
- Describe theories explaining the structure of atoms and the origin of the observed spectra.

Course Code: 3SMPH504

Course Name: Physics-V (ASTRO PHYSICS & ATMOSPHERIC SCIENCE)

Course Objective

- To gain knowledge of modern techniques, theory and observation results in astrophysics and cosmology.
- Introduce the physics of planetary atmospheres with special emphasis on the atmosphere of the earth.

Course Outcomes

Students will have understanding of:

- To understand binary stars as well as our solar system and the associated processes

occurring in the Milky Way and other galaxies.

- To describe the basic structure of an atmosphere and the climate system.
- The concept of potential temperature and how it relates to static stability.
- Know the components of the earth radiation balance and understand optical depth and transmission function.
- Derive a simple model of “green house effect”.

Course Code: 3SBCH503

Course Name: Chemistry-V (PHYSICAL INORGANIC & ORGANIC CHEMISTRY)

Course Objective

- To Study the concepts of UV and IR spectroscopy and Bio-Organic & Bioinorganic Chemistry.

Course Outcomes

- After completion of the course student will able to Understand the Spectroscopy, acid/base reactions, their products, and how buffer systems work

Course Code: 3SBCH504

Course Name: Discipline Specific Elective -II (INDUSTRIAL CHEMISTRY)

Course Objective

- Study of basic concept of distillation, evaporation, absorption, filtration and drying catalysis Microwave and Ultrasound assisted green synthesis, Green catalysis and its application.

Course Outcomes

- Knowledge of industrial chemistry and its application.

Course Code: 3SBCH505

Course Name: Chemistry-V (Elective –I) GREEN CHEMISTRY

Course Objective

- To Study the basic concepts of Green Chemistry, Green Reactions, Microwave and Ultrasound assisted Green synthesis, Green Catalysis and its application.

Course Outcomes

- After completion of the course the learners will be able to know about the reaction of Green catalysis, Microwave and Ultrasound assisted green synthesis and its modern application in Green Chemistry.

Course Code: 3SBMA503

Course Name: Discipline Specific Elective-I Mathematics-V (REAL ANALYSIS, LINEAR ALGEBRA & DISCRETE MATHEMATICS)

Course Objective

- The goal of this course is for students to gain proficiency in computation of real analysis.
- To make the student acquire sound knowledge of linear algebra.
- To familiarize the student with discrete mathematics.

Course Outcomes

- Understanding the ideas of real analysis and series and an ability to calculate with them.
- Understanding of the ideas of linear algebra and facility in solving standard examples.
- Understanding of the ideas of discrete mathematics and facility in solving standard examples.

Course Code: 3SBMA504

Course Name: Discipline Specific Elective-II Mathematics-V (RING THEORY AND LINEAR ALGEBRA - II)

Course Objective

- The goal of this course is for students to gain proficiency in computation of linear algebra.
- To make the student acquire sound knowledge of linear algebra.
- To familiarize the student with discrete mathematics.

Course Outcomes

- Understanding the ideas of Boolean algebra and ability to calculate with them.
- Understanding of the ideas of graph theory and facility in solving standard examples.
- Understanding of the ideas of discrete mathematics and facility in solving standard examples.

Course Code: 3SMPH603

Course Name: Discipline Specific Elective-I Physics-VI (SOLID STATE PHYSICS, ELECTRONICS AND LASER)

Course Objective

- Describe the difference between crystalline and non crystalline materials.
- Describe the arrangements of atoms and ions in crystalline structure.
- Explain basic Laser principle Laser behavior properties of Laser radiations, different types of Lasers and Laser applications.

Course Outcomes

- Demonstrate an understanding of the crystal lattice and how the main lattice types are described.
- Explain different lasers used and make a comparison between them.

Course Code: 3SMPH604**Course Name: Discipline Specific Elective-II Physics-VI (NANO-TECHNOLOGY AND MATERIAL SCIENCE)****Course Objective**

- To give comprehensive exposures to the students regarding various materials, crystalline, non – crystalline materials, crystal structure and their defects, the concept of phase and different types of phase diagrams.
- Experimental and computational characterization of nano-materials.

Course Outcomes

Students will have understanding of:

- Different types of materials and their structures.
- Structure dependence of various thermal, optical and mechanical properties.
- Explain the fundamental principles of nano-technology and their application to medical science.

Course Code: 3SBCH 603**Course Name: Discipline Specific Elective-I Chemistry-VI (PHYSICAL INORGANIC & ORGANIC CHEMISTRY)****Course Objective**

- To study the basic concepts of photochemistry, solution, inorganic polymer, preparation and properties of organometallic compounds.

Course Outcomes

- After completion of the course, students will be able to understand the physical photochemistry, application of inorganic polymers and organometallic compounds.

Course Code: 3SBCH604**Course Name: Discipline Specific Elective-II (NANO CHEMISTRY)****Course Outcome**

- To understand the preparation of nano-particles, organic nano-particles and about the role of nano-particles in environmental protection.

Course Outcome

After the completion of course learner is able to understand about:

- Nano chemistry of Nanomaterials and its types
- Preparation methods of Nanomaterials/Nanoparticles & nano synthesis
- Nanoscience affecting environment
- Organic nanoparticles & their characterization techniques.
- Nanomaterials for Environmental Protection

Course Code: 3SBMA603

Course Name: Discipline Specific Elective-I Mathematics-VI (METRIC SPACE, NUMERICAL ANALYSIS & STATISTICS)

Course Objective

- To introduce the concept of metric space to the students and to make them understand various familiar concept of real analysis with the help of metric space.
- To introduce the concept of compactness and connectedness w.r.t. metric space and to study some useful properties of continuous function.
- To introduce various numerical techniques to the students of solving equation and also introduce the concept of numerical differentiation and integration.

Course Outcomes

- The concept of metric space would help them to generalize this notion on some other spaces.
- The idea of compactness and connectedness would help them to work on some other useful properties of sets and continuous function.
- The techniques of numerical solution of equation of different kind (algebraic/differential/integral) would help them to find the solution of practical problems.

Course Code: 3SBMA604

Course Name: Discipline Specific Elective-II Mathematics-VI (Fuzzy Set Theory)

Course Objective

- To introduce the basic types and concepts of fuzzy sets.
- To introduce different operations on fuzzy sets.
- To introduce the concept of fuzzy arithmetic.
- To introduce the concept of fuzzy relation.
- To introduce the concept of fuzzy relation equations.

Course Outcome

On completion of this course students will be able to:

- Understand the basic concept of Fuzzy sets.
- Apply the operations on Fuzzy sets.
- Solve the Fuzzy arithmetic.
- Understand the Fuzzy relations and Fuzzy relation equations.

Master of Science (M.Sc. - Mathematics)

Programme Code - 04PGR003

PROGRAMME EDUCATION OBJECTIVE (PEO'S)

The structure of the M.Sc. (Mathematics) Programme is designed to produce graduates of mathematics and relative subjects with rigorous practical, analytical and research based skills, who are exceptionally well-equipped to go onto Masters in Mathematics, or employment in industrial, academic and the public service. The M.Sc. (Mathematics) programme provides:

- **PEO's-1:** To analyze the quantum mechanical problems.
- **PEO's -2:** To impart knowledge about various mathematical tools employed to study mathematics problems.
- **PEO's -3:** Drawing attention toward the theory related to the Radiation Detection and practical use of Dosimetry in industrial and research institutions.
- **PEO's -4:** To have knowledge about Cone and Cylinder with coincides.
- **PEO's-5:** Be familiar with group theory, ring, integral domain, field and make their fundamental strong.
- **PEO's-6:** To solve problem using expansion of functions.
- **PEO's-7:** Familiar with curve tracing.
- **PEO's-8:** Apply integral calculus in solving problems.
- **PEO's-9:** To make the student acquire sound knowledge of techniques in solving differential equations.
- **PEO's-10:** To familiarize the student with Laplace and inverse Laplace transforms as well as applications of
- **PEO's-11:** Laplace transformation in solving linear differential equations.
- **PEO's-12:** To introduce the Basic concept of Fuzzy Sets.
- **PEO's-13:** To introduce types of Fuzzy relation.
- **PEO's-14:** To be familiar with operations on Fuzzy Sets Fuzzy arithmetic.
- **PEO's-15:** To understand the solution method specific fields.
- **PEO's-16:** To understand research and knowledge of different parts of research.
- **PEO's-17:** To promote research culture and an environment that encourages the student's originality and creativity in their research.
- **PEO's-18:** Skills to enable the student to critically examine the background literature relevant to their specific fields.

PROGRAMME OUTCOMES (PO's)

- **PO's-1:** Updation and confidence in subjects.
- **PO's-2:** Development of orientation.
- **PO's-3:** Value added achievements.
- **PO's-4:** Promotion in higher education.

- **PO's-5:** Useful in competing the national level examination as NET, SLET, CSIR, Gate, JEST, CAT, MAT, etc.

PROGRAMME SPECIFIC OUTCOMES(PEO's)

- **PSO's-1:** To develop problem solving skill and apply them independently to problem in pure and applied mathematics.
- **PSO's-2:** To improve their own learning and performance.
- **PSO's-3:** To develop abstract mathematical thinking to simulate mathematical ideas and arguments.

Course Code: 6SMMA101

Course Name: ADVANCED ABSTRACT ALGEBRA-I

Course Objectives

- This course aims to provide a first approach to the subject of algebra, which is one of the basic pillars of modern mathematics.
- The focus of the course will be the study of certain structures called groups, rings, fields and some related structures.
- In particular to study in details the Sylow theorems and polynomials rings.
- This course helps to gain skill in prob is associated with the study of polynomials in several variables.

Course Outcomes

- The student will be able to define the concepts of group, ring, field, and will be able to readily give examples of each of these kinds of algebraic structures.
- The student will be able to define the concepts of coset and normal subgroup and to prove elementary propositions involving these concepts.
- The student will be able to define the concept of subgroup and will be able to determine (prove or disprove), in specific examples, whether a given subset of a group is a subgroup of the group.
- The student will be able to define and work with the concepts of homomorphism and isomorphism.
- The student will be able to apply the basic concepts of field theory, including field extensions and finite fields.

Course Code: 6SMMA102

Course Name: REAL ANALYSIS-I

Course Objectives

- The goal of this course is for students to gain proficiency in convergence, test of Sequences and series of real numbers.
- To familiarize the student with open set and closed set of real numbers.
- To make the student acquire sound knowledge of techniques in solving differential Calculus.

Course Outcomes

- Fluency in convergence test using standard methods, including the ability to find an appropriate test for a given sequence or series.
- Understanding ideas and concept of differential calculus and facility in solving standard examples.
- Understanding the ideas of open and closed sets and facility in solving standard examples.

Course Code: 6SMMA103

Course Name: TOPOLOGY-I

Course Objectives

The aim of this course is to provide students

- An introduction to theory of metric and topological spaces with emphasis on those topics that is important to higher mathematics.
- Basic notions of metric and topological spaces.
- Information about the properties of continuous mappings and convergence in topological spaces.
- The broader information of some selected types of topological spaces (compact, product, connected spaces) and countability, separation axioms including some basic theorems on topological spaces.
- Information about product invariance of certain separation and countability axioms.

Course Outcomes

Upon successful completion of the program the students will be aware of:

- The definitions of standard terms in topology.
- How to read and write proofs in topology with a variety of examples and counter examples.
- Some important concepts like continuity, compactness, connectedness, projection mapping etc

- Countability, separation axioms and convergence in topological spaces.
- Using new ideas in mathematics and also help them in communicating the subject with other subjects.

Course Code: 6SMMA104

Course Name: COMPLEX ANALYSIS-I

Course Objectives

- tell more about complex numbers and complex valued function to the students.
- To introduce the concept of conformal mapping and Bilinear transformation of different kind.
- To introduce the concept of complex integration on simply connected region and multiple connected region.
- To introduce three main and important theorem of Complex Analysis namely Liouvilles theorem,
- Morera's theorem and Cauchy's integral formula.
- To introduce Taylor's series and Laurent's series to the students.

Course Outcomes

- Understanding about complex number and complex valued function will enable them to deal with function of multi variable.
- Students will able to transform the region /object of one plane onto another plane easily.
- Cauchy theorem will help them to find the integration of function on the region where function is analytic and where it is not Analytic.
- Cauchy integral formula with help students to find the value of function at inside point of the region.
- Students will able to expand function in series of positive and negative power of variable in a given region.

Course Code: 6SMMA105

Course Name: DIFFERENTIAL EQUATION-I

Course Objective

- This course helps the students to study elementary concepts.
- To introduce the concept of simultaneous differential equations.
- Understanding the concept of integration in series.
- To understand the Existence and Uniqueness theorem.

Course Outcomes

- The student will be able to define the elementary concept of differential equations.

- The student will be able to define and work with the concept of simultaneous differential equations.
- The student will be able to define and work with the concept of integration in series.
- The student will be able to apply the iteration method.

Course Code: 6SMMA201

Course Name: ADVANCED ABSTRACT ALGEBRA-II

Course Objectives

- The focus of the course will be the study of modules over a ring.
- In particular to study in details the Noetherian and Artinian modules and rings.
- This course helps to study the Linear transformations, Algebra of Linear transformations & Linear operators.
- In particular to study in details the Nilpotent transformations, Jordan blocks & forms.
- This course helps to study the fundamental structure theorem of modules over PID and also helps to gain knowledge about its application to finitely generated abelian group.

Course Outcomes

- The student will be able to define the concepts of module over a ring and will be able to readily give examples of this kinds of algebraic structures.
- The student will be able to define and work with the concepts of Noetherian and Artinian modules and rings.
- The student will be able to define the concept of Linear transformations, Algebra of Linear transformations & Linear operators, Nilpotent transformations, Jordan blocks & forms.
- The student will be able to give detail proof and work with the concepts of Schur's Lemma.
- The student will be able to apply the basic concepts of modules, including uniform and primary modules.

Course Code: 6SMMA202

Course Name: REAL ANALYSIS -II

Course Objectives

- To make familiarize the student with Riemann-Stieltjes integral and their application.
- To make the student acquire sound knowledge of techniques in solving problems on function of several variable and Jacobian.

Course Outcomes

- Understanding ideas and concept of Riemann – Stieltjes integral and facility in solving standard examples.
- Fluency in solving standard methods, including the ability to find an appropriate method for a given function
- of several variables.
- Understanding the ideas of Jacobian and facility in solving standard examples.

Course Code: 6SMMA203

Course Name: TOPOLOGY-II

Course Objectives

- An introduction to theory of metric and topological spaces with emphasis on those topics that are important to higher mathematics.
- Basic notions of metric and topological spaces.
- Information about the properties of continuous mappings and convergence in topological spaces.
- The broader information of some selected types of topological spaces (compact, product, connected spaces)
- and countability, separation axioms including some basic theorems on topological spaces.
- Information about product invariance of certain separation and countability axioms.

Course Outcomes

Upon successful completion of the program the students will be aware of:

- The definitions of standard terms in topology.
- How to read and write proofs in topology with a variety of examples and counter examples.
- Some important concepts like continuity, compactness, connectedness, projection mapping etc
- Countability, separation axioms and convergence in topological spaces.
- Using new ideas in mathematics and also help them in communicating the subject with other subjects.

Course Code: 6SMMA204

Course Name: COMPLEX ANALYSIS-II

Course Objectives

- To introduce the concept of zero is and singularities of a complex valued function.
- To introduce residues theorem as well as some definite integral round the unit circle.
- To introduce the concept of integral of rational function on the semi circular region.

- To introduce the concept of fixed point and bilinear transformation and their special from.
- To introduce the concept of analytic function and multiple valued function.

Course Outcomes

- Understanding the concept of singularities will help student to find integral of complex valued function on some simple connected region and multi connected region.
- Students will able to solve definite integral easily which is quite difficult by analytical method.
- Understanding fixed point would help students to learn more about those type of function which posses fixed point.
- Students will learn more about everywhere differentiable function and they will learn how it helps them to decide analyticity of function.

Course Code: 6SMMA205

Course Name: DIFFERENTIAL EQUATION-II

Course Objective

- This course helps the students to study Linear and Nonlinear differential equations.
- To introduce the concept of boundedness of solutions.
- Understanding the concept of Legendre polynomials.
- To understand the Legendre's function of the second kind.

Course Outcomes

- The student will be able to define the elementary concept of Linear and non linear differential equations.
- The student will be able to define and work with the concept of Boundedness of solutions and Langrange's identity.
- The student will be able to define and work with the concept of Legendre's polynomial.
- The student will be able to apply the Neumann's integral and Christoffel's summation formula.

Course Code: 6SMMA301

Course Name: FUNCTIONAL ANALYSIS-I

Course Objectives

- Understand the Normed linear spaces and Banach spaces.
- Be familiar with the sub space and Quotient space of Banach Space.
- Understand compactness, Equivalent norms Hahn Banach theorem
- Understand the concept of Natural imbedding theorem and Riesz lemma.

- Get exposed to the conjugate space and the conjugate of an operator.

Course Outcomes

- To learn to recognize the fundamental properties of normed linear space and to learn classify the standard examples.
- To understand the Banach space.
- Demonstrate accurate and efficient use of compactness.
- To explain the conjugate space and learn to use properly the specific techniques for conjugate of an operators over the Banach space.

Course Code: 6SMMA302

Course Name: INTEGRAL TRANSFORM-I

Course Objective

- To expose students to learn Laplace and Fourier transform.
- To equip students with the methods of finding Laplace transform and Fourier transform of different functions.
- To make students familiar with the methods of solving IVP and BVP using laplace and fourier transform.
- To make students informative to complex fourier transform.

Course Outcomes

Upon successful completion of this course, students will be able

- To calculate the Laplace transform and Inverse Laplace Transform of standard functions.
- To select and use the appropriate shift theorems in finding laplace and inverse laplace transform.
- To combine the necessary Laplace transform techniques to solve second order differential equations.
- To find the complex Fourier transform of some functions.
- To find the Fourier transform of some elementary and standard functions with properties of finite Fourier sine and cosine transform.

Course Code: 6SMMA303

Course Name: Special Function – I

Course Objective

- To study the Gamma function and related functions.
- To introduce Hyper geometric differential equations and generalized Hyper geometric differential equation.
- This course helps to solve Hermit's differential equation.

- To introduce the Laguerre Polynomials.
- To introduce the Jacobi Polynomials.

Course Outcomes

- The student will be able to solve the Gamma function and related functions.
- The student will be able to solve the Hypergeometric Function.
- The student will be able to solve the Hermit Polynomials.
- The student will be able to solve the Laguerre Polynomials.
- The student will be able to study the Jacobi Polynomials

Course Code: 6SMMA304

Course Name: Advanced Discrete Mathematics (DSE - I)

Course Objective

The aim of the course is to develop students

- A solid understanding of algebraic structure and also the advanced concepts covered in the course.
- to use techniques from algebra, analysis and probability to solve problems in discrete mathematics.
- A solid understanding about semi groups, monodies, lattices and trees.
- A good grasp of the applications of this subject in other areas of mathematics and to real world problems.

Course Outcome

Upon successful completion of this course, the students will be able to:

- Understand the basic principles of sets and operations in sets.
- Demonstrate different traversal methods for trees and graphs.
- Write model problems in mathematical science using trees and graphs.
- Evaluate Boolean functions and simply expressions using the properties of Boolean algebra.

Course Code: 6SMMA305

Course Name: Partial Differential Equations (DSE - I)

Course Objectives

- Learn to solve Partial Differential Equation of Second Order.
- To make students familiar with Green's Function and Harmonic Function.
- Understand the application of Partial Differential Equations.
- Learn to solve fundamental solution of Laplace equation.

Course Outcomes

After completion the students will be able to:

- Solve Partial Differential Equation of Second Order.
- Solve some problems of Green's Function and Harmonic Function.
- Understand the application of Partial Differential Equations
- Find the solutions of Laplace equation and Poisson's equation.

Course Code: 6SMMA306

Course Name: Numerical Analysis (DSE - I)

Course Objectives

- This course aims to provide the information about systems of linear equations.
- This course helps to study the different methods of Interpolation, Differentiation and Integration.
- To understand the concept of approximation of functions.
- To introduce the concept of Ordinary and Partial differential equations.
- This course helps to gain skill in problem solving and critical thinking.

Course Outcomes

- The student will be able to solve the system of linear equations and algebraic eigen value problems.
- Understanding the ideas of solving interpolation, differentiation and integration.
- Fluency in solving approximation of functions.
- The student will be able to solve ordinary differential equation by various methods.
- The student will be able to solve elliptic, one dimensional parabola and hyperbola equations.

Course Code: 6SMMA307

Course Name: Mathematical Statistics (DSE-II)

Course Objectives

- To tell sampling distributions and estimation theory.
- To introduce the concept of testing of hypothesis.
- To introduce the concept of correlation and regression.
- In particular to study the design of experiments.
- This course helps to study multivariate analysis.

Course Outcomes

- The student will be able to solve the Mean, Variance and Proportions.
- The student will be able to find Type I and Type II errors by various distributions methods.
- The student will be able to apply method of least squares.
- The student will be able to study the analysis of variance.
- The student will be able to study covariance matrix, correlation matrix and principal components by graphing.

Course Code: 6SMMA308

Course Name: Number Theory (DSE-II)

Course Objectives

- To introduce the concept Binomial theorem.
- To introduce the concept of Congruence's and Techniques of Numerical calculations.
- To introduce the concept of Public key cryptography.
- In particular to study the Combinational number theory.
- This course helps to study Farey sequences and functions.

Course Outcomes

- The student will be able to solve Divisibility.
- The student will be able to find solutions of congruence's.
- The student will be able to apply method of Congruence and Quadratic Reciprocity.
- The student will be able to study the analysis of Functions of Number Theory.
- The student will be able to study Diophantine Equations and Farey fractions.

Course Code: 6SMMA309

Course Name: Differential Geometry (DSE-II)

Course Objectives

- To introduce the theory of space curves.
- To introduce the concept of surface in R^3 .
- To introduce the concept of Envelopes.
- To introduce the concept of Asymptotic lines and the fundamental equations of surface theory.
- To introduce the concept of Geodesics theorem and mappings.

Course Outcomes

- The student will be able to solve the theory of space curves.
- The student will be able to solve the fundamental form of surface.
- Fluency in solving Envelopes and regression.
- The student will be able to solve the fundamental equations of surface theory.
- The student will be able to apply Geodesics theorem.

Course Code: 6SMMA401

Course Name: FUNCTIONAL ANALYSIS-II

Course Objectives

- Understand the Inner product space and Hilbert space.
- Understand the Orthogonality.
- Be familiar with the concept of Riesz representation theorem for continuous linear functional on Hilbert space.
- Get exposed to the adjoint, self adjoint, Normal and Unitary operators.
- Understand Finite dimensional Spectral theory.

Course Outcomes

- To be able to understand the method of application of Open mapping theorem, Closed graph theorem, Hahn –Banach
- theorem for linear spaces, Inner product spaces, Orthogonal complements & Adjoint of an Operator
- To understand Hilbert space and the fundamental properties of it.
- To learn the application of Bessel's and Schwarz inequality.
- To explain the conjugate space of Hilbert space.
- To learn to use properly the specific techniques for operators over Hilbert space.
- To learn to use finite dimensional spectral theory.

Course Code: 6SMMA402

Course Name: ADVANCED GRAPH THEORY

Course Objectives

The aim of the course is to develop students:

- A solid understanding of the perfect graph and other class of perfect graphs.
- To understand Ramsey theory.
- A solid understanding about External graph.
- A solid understanding about Connectedness in diagraph.
- To learn properties of Tournaments.

Course Outcomes

Upon successful completion of this course, the students will be able to:

- Apply the perfect graph theorem.
- Apply Ramsey theory.
- Encode the graphs.
- Understand the connected and disconnected graphs.
- Understand the Hamiltonian tournaments.

Course Code: 6SMMA403

Course Name: INTEGRAL TRANSFORM-II (DSE - III)

Course Objectives

- To apply the Fourier transform method for solving IVP and BVP.
- To learn Hankel transform and its properties.
- To apply Hankel transform in IVP and BVP.
- To understand the basic concept of Mellin transform and its properties.

Course Outcomes

Upon successful completion of course the students will be able :

- To find the Hankel transform of some functions
- To apply the Fourier transform methods for solving functions.
- To demonstrate accurate and efficient use of Hankel transform techniques.
- To understand the application of Hankel transform
- To get exposed how to use the properties of Mellin transform in solving various functions.

Course Code: 6SMMA404

Course Name: SPECIAL FUNCTION-II (DSE - III)

Course Objectives

- Explain the method of application of Hermit Polynomials solution of Hermite's differential equation, Bateman's
- Generating Relation, Laguerre Polynomials Solution of Laguerre's differential Equation & Jacobi Polynomials.

Course Outcomes

- To be able to understand the method of application of Hermit Polynomials solution of Hermite's differential equation,
- Bateman's Generating Relation, Laguerre Polynomials Solution of Laguerre's differential Equation & Jacobi Polynomials.

Course Code: 6SMMA405

Course Name: OPERATIONS RESEARCH (DSE-IV)

Course Objective

The aim of this course is to introduce students

- To establish theories and algorithms to model and solve mathematical optimization problems that translates to real life decisions making problems.
- To get exposed to the concept of linear programming problems and algorithm of linear programming problems.
- With some key topics such as, goal programming, transportation and assignment problems, network analysis and dynamic programming that will enable students to analyze the real life problems to reach at optimality.

Course Outcomes

On completion of this course students will be able to:

- Define and formulate linear programming problems and appreciate their limitations
- Solve LPP using appropriate techniques and optimization solvers, interpret the results obtained and translate solutions into directives for s.
- Conduct and interpret post-optimal and sensitivity analysis and explain their primal-dual relationships.
- Develop mathematical skills to analyze and solve integer programming, parametric linear programming and network models arising from wide range of applications.
- Find maximum (of profit or yield) or minimum (of loss or cost) in real world objective.

Course Code: 6SMMA406

Course Name: Metric Spaces and Fixed-Point Theory (DSE-IV)

Course Objectives

- To introduce the concept of metric contraction principles.
- To introduce hyperconvex spaces and normal structure in metric spaces.
- To introduce continuous mapping in Banach spaces.
- This course helps to provide the basic information of metric fixed-point theory.
- To introduce the Banach space ultra-powers.

Course Outcomes

- The student will be able to understand the concept of Banach contraction principle.
- Understanding the concept of hyperconvexity and normal structure in metric spaces.
- The student will be able to apply Brouwer's theorem and Schauder's theorem.
- The student will be able to apply the basic concepts contraction mappings.

- The student will be able to apply the Demi closedness principle.

Course Code: 6SMMA407

Course Name: Measure and Integration Theory (DSE-IV)

Course Objectives

- To gain understanding of the abstract Measure Theory and definition and main properties .
- To construct Lebesgue Measure on the real line and in n- dimensional Euclidean space.
- To explain the basic advanced directions of the theory.

Course Outcomes

- Students acquired basic knowledge of measure and integration theory.
- Analyze measurable sets and Lebesgue measure.
- Describe the Borel sets and Measureable functions.
- The student will be able to describe the structure of measurable functions.
- The student will be able to apply Riesz theorem and Lebesgues monotone convergence theorem.

DOCTOR OF PHILOSOPHY (Ph. D – Mathematics)

Programme Code: Ph.D001

PROGRAMME OUTCOM(PO's)

Describe what student expected to know or be able to do why by the time of post graduate. At the end of the program the student will be able to learn

- **PO's-1:** Applied knowledge of mathematics comes in all the field of learning including higher research and it's extension.
- **PO's-2:** Innovate, invent and solve mathematical problems using the knowledge of pure and applied mathematics.
- **PO's-3:** Explain the knowledge of contemporary issue in the field of mathematics and applied science.
- **PO's-4:** Work affectively as an individual and also as a member or leader in multilinguistic and multidisciplinary terms.
- **PO's-5:** Adjust themselves completely to the demand of the growing field of mathematics by lifelong learning.

PROGRAMME SPECIFIC OUTCOME(PSO's)

- **PSO's-1:** To develop problem solving skill and apply them independently to problem in pure and applied mathematics.
- **PSO's-2:** To improve their own learning and performance.
- **PSO's-3:** To develop abstract mathematical thinking to simulate mathematical ideas and arguments

Course Code: 5010113201

Course Name: Research Methodology

Course Objective

- Objective of the course to enable Ph. D. scholar to understand the methods of research & different computer application in research and apply the knowledge and skills in conducting research work.

Course Outcome

- After learning this scholar will be able to understand the concept and process of research and will able to carry out their research work effectively considering the ethics of research for usefulness of society.

Course Code: 5010153201

Course Name: Advanced Mathematics

Course Objectives

- The goal of this course to enable Ph.D. scholar to acquire sound knowledge of subjective research & different application in conducting research work.

Course Outcomes

- After learning this scholar will be able to understand the concept and process of research work effectively considering the ethics of research for usefulness of society.

Course Code: 5010153202

Course Name: Fixed point theory and Application

Course Objectives

- The goal of this course to enable Ph.D. scholar to acquire sound knowledge of subjective research & different application in conducting research work.

Course Outcomes

- After learning this scholar will be able to understand the concept and process of research work effectively considering the ethics of research for usefulness of society. The student will be able to apply the basic concepts contraction mappings in fixed point theory for different space.

Course Code: 5010153203

Course Name: Topology And Functional Analysis

Course Objectives

- The goal of this course to enable Ph.D. scholar to acquire sound knowledge of subjective research & different application in conducting research work.

Course Outcomes

- After learning this scholar will be able to understand the concept and process of research work effectively considering the ethics of research for usefulness of society. The student will be able to apply the basic concepts metric and functional analysis for research work.

Course Code: 5010153204

Course Name: Algebraic Number theory

Course Objectives

- The goal of this course to enable Ph.D. scholar to acquire sound knowledge of subjective research & different application in conducting research work.

Course Outcomes

- After learning this scholar will be able to understand the concept and process of research work effectively considering the ethics of research for usefulness of society. The student will be able to apply the basic concepts Algebraic number structure analysis for research work.

Course Code: 5010153205

Course Name: Applied Matrix theory

Course Objectives

- The goal of this course to enable Ph.D. scholar to acquire sound knowledge of subjective research & different application in conducting research work.

Course Outcomes

- After learning this scholar will be able to understand the concept and process of research work effectively considering the ethics of research for usefulness of society. The student will be able to apply the basic concepts of Matrix theory for research work.

Course Code: 5010113202

Course Name: Research and Publication Ethics

Course Objective

- The objective of the course is to enable M. Phil/Ph.D scholar to understand about the publication ethics and publication misconduct and to create the awareness.

Course Outcome

- After learning this subject scholar will be able to understand the concepts and process of research and aware about the publication ethics and publication misconduct.

Course Code: 5010123202

Course Name: Research and Publication Ethics

Course Objective

- The objective of the course is to enable M. Phil/Ph.D scholar to understand about the publication ethics and publication misconduct and to create the awareness.

Course Outcome

Students will be able to understanding of

- After learning this subject scholar will be able to understand the concepts and process of research and aware about the publication ethics and publication misconduct.