**Department of Chemistry**

**Programme outcomes for Chemistry Programme 2017-2018**

| **Programme** | **Programme Outcomes** | **Programme Specific Outcomes** |
| --- | --- | --- |
| Chemistry | ● To Gain knowledge of Chemistry through theory and practicals.  ● Students will be able to solve problems by identifying the typical parts of a problem and working with a strategy. They could apply appropriate techniques to achieve a solution, correctness and interpretation of calculated results.  ● Students will be able to use standard laboratory equipment, modern instrumentation, and classical techniques to carry out experiments, as well as interpretation of data generated in instrumental chemical analyses upon completion of a B. Sc degree in Chemistry.  ● To Equip the students with the skill to analyse and solve the problems. | Students will know proper regulations and procedures for safe handling, storage and use of chemicals. Hence will become eco-friendly and eco-protective, an ability to determine hazards associated with carrying out chemical experiments in terms of chemical toxicity, chemical stability and chemical reactivity and be able to find information to enable effective risk assessments to be carried out.  ● Students will have strong foundations in basic principles and theories of the main areas of organic, inorganic, analytical, physical and biological chemistry and will be able to apply chemical knowledge in many applications. Students will understand the ethical, historic, philosophical, and environmental dimensions of problem |

**COURSE OUTCOMES**

| Paper Code | Paper Title | Course outcome |
| --- | --- | --- |
| CHEM CC 101 | Atomic Structure, Bonding, General Organic Chemistry and Hydrocarbons | ● Knows about Atomic structure quantum model. Bohr's Theory and its limitations, Schrodinger Wave Equation and its function, quantum numbers. Slater rules and its applications and limitations.  ● Explains ionic and covalent bonding with VBT and VESPER and MOT .  ● Physical effects and electronic displacement in organic molecules. ● Reactive intermediates.  ● Conformational, optical and geometrical type of stereoisomerism and assignment of configuration  ● Preparation reaction and structure of alkenes, alkenes and alkynes. |
| CHEM CC 101P CORE COURSE | Atomic Structure, Bonding, General Organic Chemistry and Hydrocarbons Lab | ● Experimentally performs volumetric determination by neutralization and redox titrations thatpr ovokes analytical skills in students.  ● In organic qualitative analysis to detect the extra element nitrogen, sulphur and halogens present in the organic compound  ● To separate the mixture by chromatography prepares students to learn separations using this technique in industrial as well as medical areas. |
| CHEM CC 202 CORE COURSE | Chemical Energetics, Equilibria & Functional Group Organic Chemistry | ● Basic laws and principles of Thermodynamics.  ● Detailed description of chemical equilibrium..  ● Preparation and chemical reaction of Alkyl halide, alcohol and phenol, aldehydes and ketones root into the understanding of their physical and chemical properties. |
| CHEM CC 202 P CORE COURSE | Chemical Energetics, Equilibria & Functional Group Organic Chemistry | ● Enthalpy of neutralization of HCl with NaOH  ● Heat capacity of calorimeter.  ● The students develop keen interest in the basic concepts of thermodynamics.  ● To determine the pH value of different solutions using pH-meter  ● The synthesis and purification of the organic compounds by crystallization and distillation |
| CHEM 303 CORE COURSE | Solutions, Phase Equilibria , Conductance, Electrochemistry & Organic Chemistry | ● Using concepts of distribution law & phase equilibrium able to describe one or multi component system, salt hydrolysis, distribution indicator and also extraction of metal from its ores.  ● Study Basic concepts and applications of electrochemistry.  ● Study preparations, physical and chemical properties of carboxylic acids, their derivatives, amines and diazonium salt.  ● Understand ideal and non ideal solutions as well as the basic concept in phase equilibrium.  ● Know about different types of conductometric and potentiometric titration. |
| CHEM CC 303 P CORE COURSE | Solutions, Phase Equilibria , Conductance, Electrochemistr y & Organic Chemistry Lab. | ● Study of distribution law and its applications.  ● To determine cell constant and equivalent conductance of weak acids  ● To perform conductometric and potentiometric titrations  ● To estimate the given functional group present in an organic compound qualitatively.  ● With the help of these experiments students come to know about the advantage of conductometric and potentiometric titrations over visually performed titrations.  ● They can analyze the given organic functional group present in an organic compound qualitatively. |
| Skill Enhancement Course I CHEM SEC 301 | Basic Analytical Chemistry | Skill enhancement courses are designed to increase the mental and experimental skills of students in chemistry.  ● Students know the analysis methods and analytical principles.  ● This course develops analytical thinking and awareness, includes basic analytical terms and its applications to soil, food and environment. A part of this course develops industrial skills and awareness regarding adulterations, contaminants and |
| CHEM CC 404 CORE COURSE | Coordination Chemistry, States of Matter & Chemical Kinetics | ● General group trends within transition elements, lanthanides and actinides.  ● Detail description of Valence Bond, Crystal Field Theory, with special reference with C No. 4 and 6. ● Transition elements play a crucial role in industrial catalytic processes that are required to produce substances and new materials at a rate far exceeding that of natural chemical reactions.  ● Detailed description of Chemical Kinetics. Theories of Reaction Rates and their comparison. |

**Programme Specific Outcomes (Mathematics)**

By the end of the program UG in Mathematics, the student will be able to:

1. Demonstrate in-depth knowledge in one of the foundational areas of the mathematical sciences.
2. Think in a critical manner.
3. Know when there is a need for information, to be able to identify, locate, evaluate, and effectively use that information for the issue or problem at hand. Formulate and develop mathematical arguments in a logical manner.
4. Acquire good knowledge and understanding in advanced areas of mathematics and statistics, chosen by the student from the given courses.
5. Understand, formulate and use quantitative models arising in mathematical science and other contexts.

**SEMESTER-1**

**Differential calculus (MATH101)**

1. Able to define the basic concepts and principles of neighborhood of a point and limits.
2. Able to define the basic concepts and principles of differential calculus of real functions.
3. Interpret the geometric meaning of differential calculus.
4. Apply the concept and principles of differential calculus to solve geometric and physical problems.
5. Analyze the properties of functions in daily life.
6. Organize solving of complex problems by combining the acquired mathematical concepts and principles.

**SEMESTER-II**

**Differential equations (MATH102)**

1. Delight the solution of differential equations of the first order and of the first degree by

variables separable, Homogeneous and Non-Homogeneous methods.

1. Find a solution of differential equations of the first order and of a degree higher than the first by using methods of solvable for *p, x* and *y*.
2. Compute all the solutions of second and higher order linear differential equations with constant coefficients, linear equations with variable coefficients.
3. Solve simultaneous linear equations with constant coefficients and total differential equations.
4. Student will be able to solve first order differential equations utilizing the standard techniques for separable, exact, linear, homogeneous, or Bernoulli cases.
5. Find the complete solution of a non-homogeneous differential equation as a linear combination of the complementary function and a particular solution.
6. Working knowledge of basic application problems described by second order linear differential equations with constant coefficients.

**SEMESTER-III**

**Real Analysis (MATH301)**

1. Describe fundamental properties of the real numbers that lead to the formal development of real analysis comprehend rigorous arguments developing the theory underpinning real analysis.
2. Demonstrate an understanding of limits and different tests and how they are used in sequences and series.
3. Construct rigorous mathematical proofs of basic results in real analysis.
4. Appreciate how abstract ideas and rigorous tests in real analysis can be applied to important practical problems in daily life.

**Integral Calculus (MATH304)**

1. Basic concepts and principles of integrals calculus of real functions.
2. Interpret the geometric meaning of integral calculus.
3. Apply the concept and principles of integral calculus to solve geometric and physical problems.
4. Understand the basic concepts of reduction formulae.
5. Able to define the basic concepts of length, rectification, area and volumes.

**SEMESTER-IV**

**Algebra (MATH401)**

1. Able to define subgroup, center and normalizer of a subgroup.
2. Able to define cycles and transpositions of a given permutations.
3. Able to prove Lagrange’s theorem, Euler’s theorem and Fermat’s theorem.
4. Able to define cyclic groups.
5. Critical approach to get a group has no proper subgroup if it is cyclic group of prime order.
6. Able to define normal subgroups, quotient groups and index of a subgroup.
7. Able to define homomorphism, kernel of a homomorphism, isomorphism.
8. Able to define Cayley’s theorem, the fundamental theorem of homomorphism for groups.
9. Able to define ring, zero divisors of a ring, integral domain, field and proof of theorems.

**Vector calculus (MATH402)**

1. Define scalars, vectors, dot product, cross product and triple product of vectors.
2. Analyse vector functions to find limits, derivatives, tangent lines and integrals.
3. Compute limits and derivatives of functions of two or three variables.
4. Differentiate vector fields.
5. Evaluate line integrals, surface area, surface integrals and volume integrals.
6. Calculate work, circulation, flux and determine gradient vector fields.

**SEMESTER-V**

**Matrices (MATH501)**

1. Able to introduce the role of vector spaces and subspaces in daily life.
2. Use essential techniques for the study of systems of Linear equations, matrix algebra, and vector space.
3. Ability to understand the eigenvalues and eigenvectors.
4. Able to understand the basic role of orthogonality and diagonalization.

**Probability and Statistics (MATH04)**

1. Basic probability axioms and rules and the moments of discrete and continuous random variables as well as be familiar with common named discrete and continuous random variables.
2. Able to define Probability, Conditional probability. Derive Baye’s theorem.
3. How to derive the probability density function of transformations of random variables and use these techniques to generate data from various distributions.
4. How to calculate probabilities, and derive the marginal and conditional distributions of bivariate random variables.
5. Methods of finding the probability distributions by Binomial, Poisson’s and Normal distributions.
6. How to calculate probabilities of absorption and mathematical expectation.

**SEMESTER-VI**

**Numerical methods (MATH601)**

1. Define Basic concepts of operators *Δ,Ε, ∇.*
2. Find the difference of polynomial.
3. Solve problems using Newton forward formula and Newton backward formula.
4. Derive Gauss’s formula and Stirling formula using Newton forward formula and Newton
5. backward formula. Find maxima and minima for differential difference equation.
6. Derive Simpson’s 1/3 ,3/8 rules using trapezoidal rule.
7. Find the solution of the first order and second order equation with constant coefficient.
8. Find the summation of series finite difference technique.
9. Find the solution of ordinary differential equation of first by Euler, Taylor and Runge-Kutta Methods.

**Transportation and Game Theory (MATH605)**

1. Able to understand the concepts of transportation to how to get maximum profit and minimum cost by using North West Corner method, Least cost entry method and Vogel’s approximation method.
2. Able to understand the concept of assignment to how get assignment as per their work and capacity by Hungarian’s method.
3. The course deals with Mathematical game theory. The game theory became a popular tool for analyzing of intelligent entities in many situations of competition or cooperation. Students will go through basic terminology of games by the mechanism of their playing (sequential, strategic), by distribution of payoffs in a game (zero/nonzero sum games), by possible cooperation of players (cooperative, non-cooperative) and also by state of information in a game (complete/incomplete information).
4. The games will be extended with possible repetition of moves (repeated games) by different methods and its effect to player’s behavior.

# Department of Physics

# Programme Outcomes

**PROGRAMME SPECIFIC OUTCOMES: This undergraduate course in Physics Would provide the opportunity to the students:**

* To understand the basic laws and explore the fundamental concepts of physics
* To understand the concepts and significance of the various physical phenomena.
* To carry out experiments to understand the laws and concepts of Physics.
* To apply the theories learnt and the skills acquired to solve real time problems.
* To acquire a wide range of problem solving skills, both analytical and technical and to apply them.
* To enhance the student’s academic abilities, personal qualities and transferable skills this will give them an opportunity to develop as responsible citizens.
* To produce graduates who excel in the competencies and values required for leadership to serve a rapidly evolving global community.
* To motivate the students to pursue PG courses in reputed institutions.
* This course introduces students to the methods of experimental physics. Emphasis will be given on laboratory techniques specially the importance of accuracy of measurements.
* Providing a hands-on learning experience such as in measuring the basic concepts in properties of matter, heat, optics, electricity and electronics.

**Core Papers:**

**PHYS101TH- Mechanics:** The students would learn about the behaviour of physical bodies it provides the basic concepts related to the motion of all the objects around us in our daily life. The course builds a foundation of various applied field in science and technology; especially in the field of mechanical engineering. The course comprises of the study vectors, laws of motion, momentum, energy, rotational motion, gravitation, fluids, elasticity and special relativity.

**LAB:** Students would perform basic experiments related to mechanics and also get familiar with various measuring instruments would learn the importance of accuracy of measurements.

**PHYS 201 TH - Electricity, Magnetism And EMT**: It gives an opportunity for the students to learn about one of the fundamental interactions of electricity and magnetism, both as separate phenomena and as a singular electromagnetic force. The course contains vector analysis, electrostatics, magnetism, electromagnetic induction and Maxwell’s equations. The course is very useful for the students in almost every branch of science and engineering.

**LAB:** Students would gain practical knowledge about electricity and magnetism and measurements such as: Resistance, Voltage, current etc.

**LAB:** Students would gain practical knowledge about heat and radiation, thermodynamics, thermo emf RTD etc. and perform various experiments.

**PHYS301TH- Thermal Physics and statistical Mechanics**: The students will learn about three major statistics M-B, F-D and B-E statistics. They also greatly benefited for further discussion in different branches of Physics.

**PHYS 302TH(SEC-I) Physics workshop skills:-** The students will learn practical knowledge of instruments and they will use it in Industrial working after studies.

**PHYS304(SEC-**II) **Electrical Circuits and Network Skills:-** The students will learn a lot about daily life electrical circuits and practical knowledge of these gadgets. They will also be in a position to use it for higher studies.

**PHY0 401TH- Waves and Vibrations:** The course comprises of the study of superposition of harmonic oscillations, waves motion (general), oscillators, sound, wave optics, interference, diffraction, polarization. The course is important for the students to make their career in various branches of science and engineering, especially in the field of photonic engineering.

**LAB:** The practical knowledge of wave motion doing experiments: Tuning fork, electric vibrations. They would also learn optical phenomena such as interference, diffraction and dispersion and do experiments related to optical devices: Prism, grating, spectrometers

**BSCPHY0513 Digital Electronics:** This course helps the students to gain basic ideas of the construction and working of electronic devices and circuits and to understand the fundamentals of communication systems. The course includes the study of number systems, Boolean algebra, logic gates, combinational circuits, sequential circuits, memory devices and IC technology. The course is of much practical purpose for the students to learn basics of digital electronics. The digital electronics has wide applications in computing, process control, signal processing, communication systems, digital instruments etc.

**BSCPHY0514: Mathematical Physics:** Students would be able to understand the mathematical methods essential for solving the advanced problems in physics. It would be helpful in the development of the ability to apply the mathematical concepts and techniques to solve the problems in theoretical and experimental physics. The knowledge of mathematical physics would be beneficial in further research and development as it serve as a tool in almost every branch of science and engineering

**BSCPHY05/623: Renewable Sources of Energy :-** The students will get information about renewable and non renewable sources of energy. They will also help the people to get sanitize about problems of nature.

**BSCPHY05/620: Medical Physics:-** Nano Technology and MRI functioning of different instruments of medical science, their practical handling and use.

**DEPARTMENT OF ZOOLOGY**

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| **CLASS** | **SEM** | **PROGRAMME** | **COURSE STUDY OUTCOMES** |
| **BSc.III** | **Sem-V** | BSCZOO0409  CELL BIOLOGY | The students will to be able to understand fundamental principles of cell biology, structure and functions of cell organelles, cell signaling, appreciate how cells grow, divide, survive, die and regulate these important processes. |
| BSCZOO0510  BIOCHEMISTRY | The students will to be able to understand essentials of the metabolic pathways along with their regulation and the principles, instrumentation and applications of Bio-analytical techniques. |
| BSCZOO0511  BIOTECHNLOGY | The students will to be able to use or demonstrate the basic techniques of biotechnology like DNA isolation, PCR, transformation, restriction digestion etc.,  Ethical and social issues regarding GMOs and designing a project for research and execute it. |
| **Sem-VI** | BSCZOO0512  MOLECULAR BIOLOGY | The students will to be able to describe the basic structure and chemistry of nucleic acids, replication machinery and regulatory mechanisms in prokaryotes and eukaryotes. |
| BSCZOO0613  ECOLOGY | The students will to be able to demonstrate the key concepts in ecology and apply the basic principles of ecology in wildlife conservation and management.  Inculcate scientific quantitative skills, evaluate experimental design, read graphs, and analyze and use information available in scientific literature. |
| BSCZOO0614  APPLIED ZOOLOGY | The students will to be able to understand the variation amongst parasites, parasitic invasion in both plants and animals; applicable to medical and agriculture aspects.  Develop skills and realize significance of diagnosis of parasitic attack and treatment of patient or host. |
| **BSc.II** | **Sem-III** | BSCZOO0305  DEVELOPMENTAL BIOLOGY | The students will to be able to understand the events that lead to formation of a multicellular organism from a single fertilized egg, the zygote. Describe the general patterns and sequential developmental stages during embryogenesis;  and understand how the developmental processes lead to establishment of body plan of multicellular organisms. |
| BSCZOO0306  ANIMAL PHYSIOLGY | The students will to be able to know basic human physiology and correlate with histological structures, Understand how animals maintain an internal homeostatic state in response to changes in their external environment and |
| **Sem-IV** | BSCZOO0407  CYTGENETICS | The students will to be able to have a deeper understanding of the varied branches of the biological sciences like microbiology, evolutionary biology, genomics and metagenomics and gain knowledge of the basic principles of inheritance. |
| BSCZOO0408  EVOLUTION BIOLOGY | The students will to be able to gain knowledge about the relationship of the evolution of various species and the environment they live in. Get motivated to work towards mitigating climate change so that well adapted species do not face extinction as a result of sudden drastic changes in environment.  Use knowledge gained from study of variations, genetic drift to ensure that conservation efforts for small threatened populations are focused in right direction. Predict the practical implication of various evolutionary forces acting on the human population in the field of human health, agriculture and wildlife conservation. |
| **BSc. I** | **Sem-I** | BSCZOO0101  INVERTEBRATES-I  BSCZOO0102  INVERTEBRATES-II | The students will to be able to understand about the importance of systematics, taxonomy and structural organization of animals living in diverse habitats and explore evolutionary history and relationships of different non-chordates through practical sessions, team work, group discussions, assignments and projects. |
| **Sem-II** | BSCZOO0203  BIOLOGY OF CHORDATES-I  BSCZOO0204  BIOLOGY OF CHORDATES-II | The students will to be able to understand about the importance of systematics, taxonomy and structural organization of animals living in diverse habitats and explore evolutionary history and relationships of different chordates, through practical sessions, team work, group discussions, assignments and projects.  Comprehend the circulatory, nervous and skeletal system of chordates. |