

## Department of Physics

### Course Outcomes (COs):

#### 1. Course: F.Y. B.Sc. (Physics) Semester- I (Mechanics, Properties of Matter, Waves & Oscillation)

By the completion of this course, the students will be able to

- CO1:** understand the concepts of gravitation via calculations of various parameters such as gravitational force, field, potential etc., and planetary motion (Kepler's law).
- CO2:** study the concept of rigid body, Moment of inertia and conservation of angular momentum (concept of zero external torque).
- CO3:** learn the concepts of SHM's of various body (point mass and continuous bodies), calculations of frequency of SHM's and condition of resonance.
- CO4:** Study the composition of two SHM's to get different Lissajous figures, Production, detection and applications of ultrasonic waves.
- CO5:** know in details the elastic constants, properties of elastic bodies and different methods to measure elastic constants.
- CO6:** study the concepts of kinematics of moving fluids, Bernoulli's theorem, surface tension and viscosity with measurement through Jaeger's method.

#### 2. Course: F.Y. B.Sc. (Physics) Semester- II (Kinetic theory, Thermodynamics and electric currents)

By the completion of this course, the students will

- CO1:** be able to get knowledge regarding kinetic theory of gases, transport phenomenon in gases like transport of mass, momentum and energy.
- CO2:** get the concepts of basic laws of thermodynamics, different thermodynamic processes, concept of internal energy, entropy, Carnot's engine, impossibility of absolute zero temperature, etc.
- CO3:** enjoy the study of Joule-Thomson effect, liquefaction of hydrogen and helium gases, thermodynamic systems, variables and relations.
- CO4:** understand the motion of charge particles in electric and magnetic fields, working of mass spectrograph, linear accelerator and cyclotron.
- CO5:** be able to understand the basic network theorems, construction and working of Ballistic galvanometer, concepts of varying currents through different circuits, Kirchoff's law to calculate currents in different branches of circuits.
- CO6:** understand the concepts of alternating current with various combinations of resistor, capacitor and inductor, theory of transformer and energy losses in transformer.

#### 3. Course: S.Y. B.Sc. (Physics) Semester- III (Mathematical background and Electrostatics)

By the completion of this course, the students will

- CO1:** be able to understand the basic concepts of divergence, gradient and curl as well as study of stationary charges via electric forces, electric field, electric potential, etc and determination of magnetic field by Ampere's law.
- CO2:** get the knowledge of Laws of electromagnetic induction via Faraday's law and knowledge of electromagnetic field by Maxwell's equations.
- CO3:** understand the semiconductor Physics and its applications, Hall effect and knowledge of LED.
- CO4:** study the BJT along with working and applications, also study the OP-AMP and its applications.
- CO5:** get the knowledge of special theory of relativity via length contraction, time dilation, relativistic addition of velocity, frames of references, relativity of mass and Einstein's mass energy relation.
- CO6:** understand the structure of earth, types and causes of earthquakes, intensity of earthquakes, scattering, absorption and reflection of solar radiation by atmosphere and mechanism of cloud formation, also different energy sources inside and above the earth's surface.

**4. Course:** S.Y. B.Sc. (Physics) **Semester- IV** (Ray Optics, Wave Optics, Propagation of electromagnetic waves, Non-conventional energy sources)

By the completion of this course, the students

- CO1:** will understand the concept of ray optics, determination of focal length, wavelength and refractive index by Newton's ring experiment.
- CO2:** will be able to get the knowledge of bending of light beam, Fresnel and Fraunhofer diffractions, grating and Rayleigh's criterion for resolution.
- CO3:** understand the phenomenon of polarization, Nicol prism, production and detection of circularly and elliptically polarized light.
- CO4:** will enjoy the study of MASER, LASER and their applications, three levels and four levels laser system and Ruby laser and He-Ne laser.
- CO5:** will study the structure of fiber optics and principle of propagation of light through it, losses in fiber optics, advantages and applications of fiber optics.
- CO6:** study Solar energy, Wind energy, ocean energy- Waves & tides, geothermal energy, Hybrid Systems, Hydrogen energy systems, Fuel cells, different types of solar energy storages and their principles, Photo-voltaic systems-concept, operating principle and applications.

**5. Course:** T.Y. B.Sc. (Physics) **Semester- V** (Quantum mechanics, Atomic and molecular spectroscopy, Nuclear Physics, Hybrid parameters and Oscillators)

By the completion of this course, the students will

- CO1:** study the failure of classical mechanics along with origin of quantum mechanics, matter waves, wavepackets, and Heisenberg's uncertainty principle.
- CO2:** be able to understand the concept of Schrodinger time dependent and independent wave equations, Operators, eigen value and eigen function, application of quantum mechanics to particle in 1-D box and zero point energy of simple harmonic oscillator.
- CO3:** study the atomic models, X-ray, Raman effect and Raman spectroscopy.
- CO4:** will be able to get the knowledge of detection of charged particles, alpha decay, beta decay, Nuclear fission and Nuclear fusion.
- CO5:** will enjoy the study of Hybrid parameters- low frequency equivalent of CE amplifier & its analysis, General principles of amplifier classification, Noise and distortions in amplifiers.
- CO6:** will study the positive and negative feedbacks in amplifiers along with advantages and disadvantages, oscillators and multivibrators.

**6. Course: T.Y. B.Sc. (Physics) Semester- VI (Statistical Mechanics and Solid State Physics)**

By the completion of this course, the students

- CO1:** will get the knowledge of Basics of Statistical Mechanics such as Phase space, Unit Cell, Probability, Molecular speed distribution etc.
- CO2:** will be able to understand the concepts of MB, BE and FD statistics along with the knowledge of Fermi energy and Fermi temperature.
- CO3:** can enjoy Crystallographic study such as unit cell, Miller Indices, Reciprocal lattice and defects in crystals which are responsible for change of electrical properties and change of colours of matters.
- CO4:** will study the band structure of material and classification of the material viz: insulator, conductor and semiconductor.
- CO5:** will be able to understand the classification of magnetic materials such as dia, para and ferromagnetic materials, also Langevin's theory of dia and paramagnetic and losses in magnetic materials.
- CO6:** will acquire the knowledge of Superconductivity and nano-technology and their applications.

## **Department of Electronics (Instrumentation)**

### **Course Outcomes:**

#### **Semester I**

#### Electronics Paper I

1. Students study the basics of network theorems and its application.

2. Study of semiconductor devices and its application.
3. Learn the basic concept of biasing and stabilization.
4. Understand the principle and working of various types of measuring instruments.
5. Study of basics in integrated circuits and embedded system.
6. Practical course inculcates the basic skills required for understanding the concepts and authenticating the basic laws and principles of network theorems in electronics.

### **Semester II**

#### Electronics Paper II

1. Study the number system and logic gates.
2. Understand the applications of logic gates.
3. Understand the use of K-maps for digital circuit design.
4. Study of sequential and combinational logic circuits.
5. Study of semiconductor memories.
6. Practical course develop the basic skills in designing of logic circuits.

### **Semester III**

#### Electronics Paper III

1. Study of hybrid equivalent circuit.
2. Study of types of power amplifier and its applications.
3. Understand the concept of feedback, feedback amplifiers and oscillators.
4. Understand the concept of difference amplifiers and its advance applications.
5. Study the concept of A/D and D/A convertors and its types.
6. Practical course build up the confidence and basic skills in designing of analog circuits.

### **Semester IV**

#### Electronics Paper IV

1. Study and understand the architecture of 8-bit microprocessors (8085).
2. Understand the addressing modes and instructions of 8085.
3. Understand and design of the programming of microprocessor 8085.
4. Study and understand the architecture of 8255 Programmable Peripheral Interface.
5. Study the analog, digital and Fiber optic communication.
6. Understand the concept of Modulation, Demodulation and its types.
7. Practical course build up the basic skills in designing of programmes to perform specific task in 8085 microprocessor.

### **Semester V**

#### Electronics Paper V

1. Study the various types of biomedical instruments.
2. Study and understand the various types of transducers.
3. Study the various temperature sensing devices and measurement techniques.
4. Understand the concept of IC 555 Timer and concept of multivibrator using IC 555.
5. Understand the IC565 PLL and its various applications in communication and frequency generation.
6. Understand and study of various types of sensors and actuators.
7. Practical course develop the basic skills in designing of various multivibrators using IC555 and also understand the various types of sensors and actuators.

## **Semester VI**

### Electronics Paper VI

1. Study and understand basics of 16-bit microprocessors IC 8086.
2. Understand the addressing modes and instructions of 8086.
3. Understand and design of the programming of microprocessor 8086.
4. Study and understand the architecture of 8051 Microcontroller.
5. Understand the ability to differentiate microprocessor and microcontroller.
6. Understand the instruction set of 8051.
7. Understand and design of the programming of microcontroller 8051.
9. Understand the fundamentals of advanced microcontroller technology.
10. Develop basic skills in construction and preparation of report of Minor projects on microprocessor 8085, 8086, microcontroller 8051, AVR, ARM, Communication, sensors, power amplifier, code converters, Biomedical Electronics, Digital Electronics or any advance topic of Electronics.

## **Department of Zoology**

### **Course Outcomes**

#### **Semester I Zoology Paper I**

1. Study Classification and general characters, type study and organ system of all the non-chordates phylum.
2. Know the parasitic adaptations from protozoan's.
3. Learn the life history of *Ascaris lumbricoides*, *Fasciola hepatica*, and pertaining pathogenic impacts.
4. Study Water vascular system in Echinodermata.
5. Learn general characters and body organization of Balanoglossus.
6. Practically students learn observations of available specimens ,classification up to classes and sketching of the specimens from phylum protozoa to Hemichordata.
7. Understands internal body parts of the animal when they observe the demonstration of the specimens.
8. Learn the culture of Paramoecium and Volvox.
9. Mounting of selected body parts of some animals.

#### **Sem-II (Zoology Paper-II)**

1. Learn general organization of Prokaryotic and Eukaryotic cell.
2. Study the ultra structure of cell organelles ,nucleus ,chromosomes and plasma membrane.
3. Understand the giant chromosomes.
4. Study cell division (Mitosis and Meiosis).
5. Learn Gametogenesis and Fertilization.
6. Study the development of cleavage up to the formation of Amphioxus.
7. Study the development of cleavage ,blastula, gastrula up to the formation of three germ layers in Frog as well as Chick.
8. Learn structure and functions of extra embryonic membranes .
9. Learn parthenogenesis and regeneration .

10. Learn types, sources and uses of stem cells.

**Practical-**

1. Learn stages of cell division and cytological experiments
2. Understand embryological developmental stages of Frog and Limnea.
3. Understand the life cycle of Mosquito, Housefly, Cockroach, butterfly, and Moth.

**Semester III (Zoology Paper-III)**

1. Understand the origin of chordate.
2. Learn the type study of protochordate *Amphioxus* and Scoliodon .
3. Understand migration in fishes.
4. Study the type study of *Rana tigrina* and *Calotes versicolor*.
5. Understand the parental care and snake venom.
6. Learn the type study of *Columba livia* and migration in birds.
7. Understand prototheria, metatheria and aquatic Mammals.
8. Understand physiological embryological morphological, anatomical evidences of evolution.
9. Understand evolution of man.
10. Learn connecting links Peripetus and Archaeopteryx.
11. Understand evolution of heart and aortic arches.
12. Learn the aquatic, terrestrial and desert adaptations.

**Practical-**

1. Detected the monohybrid and dihybrid cross with the help of plastic beads.
1. Identify the chordate specimens .
2. Understands internal body parts of the animal when they observe the demonstration of the specimens.
3. Learn the osteology of Rabbit and Varanus

**Zoology paper IV**

1. Know the basic concept of genes and observe the monohybrid and dihybrid traits in the societal atmosphere.
2. Students understand the gene linkage and its arrangement and types complete and incomplete.
3. Learn the mechanism, theories, types and they also aware factors affecting crossing over.
4. Learn multiple alleles in relation to eye color in *Drosophila* .
5. Learn multiple alleles in relation to blood groups in Man.
6. Understand and aware Erythroblastosis foetalis.
7. Learn chromosomal and Genic balance theory of sex determination with suitable examples.
8. Understand environmentally and hormonally controlled sex determination.
9. Understand the Gynandromorphs in animals.
10. Learn and aware the genetically diseases Sickle cell anemia and Diabetes mellitus.
11. Understand the some common syndrome like the Turner's syndrome, Klinefelter's syndrome, Down's and Edward's syndrome.
12. Learn physiologically and biochemically genetical disease Cystic fibrosis, Phenylketoneuria, Albinism and Alkaptonuria.
13. Understand and aware of Hemophilia as a sex linked genetic disorders and their inheritance in Man.
14. Understand and aware of Color blindness as a sex linked genetic disorders and their inheritance in Man.
15. Learn and aware of Chorionic villous sampling and

Amniocentesis.

16. Understand male and female birth control measures.

17. Learn identical and Siamese twins and significance of twins study.

18. Learn biotic and abiotic factors. Also study of ecosystem relationships between habitat and ecological niche.

#### **Practical-**

1. Practical course develop interest to solve the Mendel's monohybrid and dihybrid cross.

2. Understand and develop the skills of preparation of human karyotypes very easily

3. Understand photo slides of syndrome

4. Learn human genetic trait and apply the Hardy-Weinberg principle in baldness, length of index finger etc.

5. Estimate dissolved oxygen, CO<sub>2</sub> very carefully.

### **Zoology Semester V**

1. Study of physiology of respiration, circulations and respiratory pigments.

2. Learn structure of human heart its function and cardiac cycle.

3. Understand the structure, types, and composition of muscle, neuromuscular junction, the mechanism of muscle contraction by sliding filament theory, and the physical and chemical changes during muscle contraction.

4. Study the structure of neuron its types, Conduction of nerve impulse through medullary and non-medullary nerve fiber, role of the neurotransmitters, and structure of synapse.

5. Learn the hormones and physiological role of Pituitary gland, Adrenal gland, Thyroid gland, and Islets of Langerhan very carefully.

6. Understand the hormonal disorder of Dwarfism, Gigantism, Acromegaly, Goiter, Myxoedema and Cretinism.

7. Learn hormonal control of reproduction in males and Females, structure and physiology of Mammalian placenta, Menstrual cycle and Estrous cycle.

8. Study the osmoregulation and ionic regulation in aquatic animals, Ammonotelism, Ureotelism and Uricotelism.

9. Understand the beneficial insects and harmful insects with suitable examples

10. Study the Apiculture and the Sericulture.

11. Study the scope, importance, present status of aquaculture in India.

12. Learn the circular hatchery and modern drugs used in fish breeding as well as monoculture, polyculture and integrated aquaculture.

#### **Practical-**

1. Practical course develop the basic skills necessary for the understanding of the Physiological concepts and carefully handled the blood parameter apparatus.

2. Students understand the life history of useful insects, honey bees, Lac insect and silk Moth.

3. Learn and observe carefully the histological slides of major organs of the body system.

5. Identify and classify the locally available fishes, their economical values.

### **Semester-VI Zoology Paper VI**

1. Understand that DNA is a genetic material with experimental proofs Griffiths experiment, Avery and coworkers experiments, Hershey and Chase experiment.

2. Learn the chemistry of DNA and RNA, types of RNA.
3. Learn Messelson and Stahl experiment of DNA replication.
4. Learn one gene one enzyme hypothesis and genetic code .
5. Learn Lac –Operon model of E.coli ,mutation theory of DeVries,chromosomal aberrations and polymerase chain reaction.
6. Understand Western and Southern blotting technique.
7. Study the recombinant DNA technology and gene cloning-enzyme in recombinant DNA technology.
8. Study of Immunology and Innate and adaptive innate and adaptive immunity .
9. Study of cell mediated immunity and role of cytotoxic T- cell.

#### **Practicals-**

1. Knows the handling skills of micro technique scope and their importance.
2. Perceive preparation of fixatives.
3. Knows the collection of various tissues ,organs from slaughter house for the permanent slide of micro preparation Process.
4. Understand the use and care of oven and its functions.
5. Understand honing stropping knives , section cutting and spreading .

## **Department of Botany:**

### **Paper-1 Botany**

This course makes easy students to understand the lower plants like algae, bryophytes and pteridophytes. Students learn the Preparation of temporary mount, identification of unknown cryptogams and identify the specimen by giving the reason e.g. Oedogonium, Hydrodictyon, etc. Students also acquire the knowledge of handling the compound microscopes. They also learn different types of life cycles and alternation of generations phenomenon present in lower plants.

### **Paper-II Botany**

This course makes students familiar to Morphology of Gymnosperms and anatomy of the members like, Pinus and Gnetum is also revealed. Also they learn the technique like Preparation of double stained permanent mount of Pinus stem, needle and Gnetum stem. The students also Study the fossil plants by observing the slides and specimens of important fossil gymnosperms like Lyginopteris. Detailed morphological study of types of root, stem and leaf of angiosperms with its modifications also done by students for e.g. Forms of corolla, Types of placentation, Morphology of fruits etc. They also learn the concept of Utilization of plants as Spices, fiber yielding plants etc.

### **Paper-III Botany**

Students are acquainted about Fossils plants like Compression, impression etc. A complete fossils study is made with illustrating the examples from an ideal fossil i.e. Lyginopteris oldhamia. Students get known with techniques of Preparation of permanent double stained slide with special emphasis on T.S. /T.L.S. /R.L.S. of stem. Students observe a wide range of flowers available in locality and methods of their pollination. Also they study Taxonomical description of plants belonging to the different families in technical language and their identification up to family level. They also study the embryology of angiosperms with special references to the

microsporogenesis , megasporogenesis , development of male and female gametophyte, and embryogenesis etc.

#### **Paper-IV Botany**

An elaborated concept of cell in detail is studied by the students i.e. Prokaryotic and Eukaryotic cell along with the other components like Cell wall and its Structure and Functions, Plasma membrane and its Structure (models) and Functions etc. They learn about morphology of chromosomes and their aberrations. The students are also acquainted with Mendel's laws of Dominance and segregation etc. along with concept of linkage phenomenon and numerical problems based on that. They also study the non allelic interaction of genes like complementary ratio, supplementary ratio etc. They also gain knowledge of enzymology in details and their mechanism of action.

#### **Paper-V Botany**

Students are erudite to Importance of water to plant life by studying the phenomenon like Imbibition, Diffusion, Osmosis, Plasmolysis, Active and passive Absorption of water by plants. Also they learned in details the phenomenon like Ascent of sap and theories like Root Pressure and Transpiration Pull Theory. The important phenomenon in plants like Photosynthesis and Respiration are also learned by the students. Various aspects of plant physiology, metabolism and growth are taught to the students. The flowering in plants is a major process in which plants prepare themselves for the reproduction this flowering and photoperiodism is cram in details.

#### **Paper-VI Botany**

The students are acquainted with the knowledge of Nucleic acid like DNA and RNA and the experiment related to discovery of them e.g. Giffith's Expt, Hershy and Chase Expt. etc. DNA Double Helical model, DNA replication in Eukaryotes; DNA Packaging - Nucleosome and Solenoid is studied in detail. Also Satellite, Repetitive DNA and Transposable element in plants (AC-DS system) are also studied. Advance molecular biology process like Regulation of Gene Expression in Prokaryotes ( Operon concept with special reference to Lac Operon); Regulation of gene expression of Eukaryotes (Britton Davidson Model) are also acquainted by the students. The students get insight of phenomenon like Protein Folding Mechanism and Structure of proteins (Primary, Secondary, Tertiary and Quaternary).

## **Department of Chemistry**

### **Course Outcomes**

#### **1S Chemistry**

This course facilitates students to understand fundamental laws regarding states of matter, thermodynamics and structure of atom. Students acquire thorough knowledge of mole concept, derivations, depictions and problem solving and periodic properties of the elements including the preliminary theories of bonding. Students learn fundamental concepts of organic and inorganic chemistry which governs the structure, bonding, properties, structural effects, acid-base theories, preparation methods, and reactivity of organic molecules.

Chemistry is an experimental and applied subject. Hence, practical course inculcates the basic skills required for understanding the concepts and authenticating the basic laws and principles of chemistry & helps in development of practical skills of the students.

### **2S Chemistry**

This course facilitates students to physical properties and fundamental laws of reactivity of molecules. Students acquire comprehensive knowledge of periodic properties of the elements and physical properties of matter along with nature of bonding in molecules. Students absorb essential concepts of organic chemistry and reactivity of commercial organic molecules like Phenols, Ethers, Epoxides.

The practical course inculcates the basic skills to perform experiments to measure physical properties of chemicals and qualitative analysis of various metal ions in a given mixture.

### **3S Chemistry**

Students are made aware about Thermodynamics and equilibrium processes, States of matter and Electrochemistry. Students will get familiar with phase rule, phase diagram of one and two component systems. Students attain basics and applications of stereochemistry of different isomers and important chemicals like aldehydes, ketones.

Students are introduced to analytical chemistry in which they are made aware of inorganic quantitative analysis (Volumetric and Gravimetric analysis) wherein they study non-instrumental volumetric analysis which comprises of study of various titrations, indicators used in it & some theoretical aspects related with titrations. Along with it they also study error in quantitative analysis & ways to minimize them. They instill skills related to chemical kinetics and physical property measurement.

Students are trained to determine the rate constant of chemical reactions, solubility, heat of neutralization, critical solution temperature of partially miscible system & distribution coefficient.

### **4S Chemistry**

Students are introduced to chemistry of d and f-block elements and metallurgy to understand chemical reactions and processes occurred in metallurgy. They learn colligative properties and their applications and understand the crystalline state in-depth. The emphasis is on learning reaction mechanisms of various organic reactions.

In practical sessions, students get training for using complexometric titrations and spectrophotometric techniques. They learn isolation of natural products like casein from milk, caffeine from tea leaves.

### **5S Chemistry**

Students are introduced to co-ordination compounds and theories like VBT, CFT to understand their formation and bonding. organometallic chemistry & use of organometallic compounds in synthesis of organic as well as inorganic compounds. They also study heterocyclic compounds and their role in everyday life.

Students learn basic concepts of photochemistry and molecular spectroscopy and their applications.

Students are trained in the techniques such as Conductometry, Polarimetry and Potentiometry. Learners become proficient in preparation of co-ordination compounds of different types.

## **6S Chemistry**

Learners develop acquaintance for spectrophotometry, colorimetry, various types of chromatography like Paper, TLC, etc. Students get in-depth knowledge of Infra-Red (IR), Nuclear Magnetic Resonance (NMR), Mass and Ultra-Violet (UV) spectroscopy. They acquire understanding of Quantum Mechanics, Electrochemistry, Nuclear chemistry and their applications.

Learners get training for chromatographic techniques like Paper, TLC, etc. , organic quantitative analysis, and instrumental techniques viz. pH-metry, Potentiometry, Conductometry and Colorimetry.

## **Department of Mathematics**

### **Course Outcome of B. Sc. Mathematics**

#### **B.Sc. I Paper I: Course Outcome of Algebra and Trigonometry**

Students will able to

- Describe real and imaginary parts of circular and hyperbolic functions.
- Find roots of complex numbers, Relation between circular functions and hyperbolic functions
- Compute summation of Series based on Geometric series, Binomial series, Gregory Series, Sine series, Cosine series, Exponential series.
- Define Quaternion and Illustrate operations on Quaternion.
- Evaluate Relations between the roots and coefficients of equations.
- Find Solutions of cubic and Biquadratic equations.
- Evaluate the rank of a matrix by using the concept of the determinant rank.
- Obtain the characteristic polynomial of a matrix.
- Obtain the eigenvalues, eigenvectors of a matrix.

#### **B.Sc. I Paper II: Course Outcome of Differential and Integral Calculus**

Students will able to

- Define limit and Continuity of a function at a point.
- Determine whether a given function is continuous or not.
- Evaluate nth order derivative of product of two functions.
- Identify the types of indeterminate forms.
- Know Rolle's theorem and its geometrical meaning
- Deduce the mean value theorems of differentiability by using Rolle's theorem give the geometrical interpretation of the mean value theorems
- Apply Mean Value Theorems to various problems of Analysis.

- Define partial derivatives of the first order for a function of several variables.
- Define and identify homogeneous functions.
- State, prove and use Euler's theorem for homogeneous functions.
- Evaluate reduction formulae.
- Find the volumes of some solids of revolution,
- Find the areas of some surfaces of revolution.

### **B.Sc. I Paper III: Course Outcome of Differential Equations: Ordinary and Partial**

Students will be able to

- Extract the solution of differential equations of the first order and of the first degree by variables separable, Homogeneous and linear DE, Exact DE methods.
- Find a solution of differential equations of the first order and of a degree higher than the first by using methods of solvable for  $p$  and  $y$ .
- Compute all the solutions of second and higher order linear differential equations with constant coefficients, linear equations with variable coefficients.
- Solve simultaneous linear equations with constant coefficients.
- Form partial differential equations.
- Find the solution of First order partial differential equations for some standard types.
- Solve Partial differential equations of second and higher orders.
- Evaluate Homogeneous and non-homogeneous equations with constant coefficients.

### **B.Sc. I Paper IV: Course Outcome of Vector Analysis and Solid Geometry**

Students will be able to

- Find Scalar Triple Product, Vector Triple Product.
  - Evaluate Vector Differentiation and Vector Integration.
  - Define Space curves and  $t$ ,  $n$ ,  $b$  vectors.
  - Compute SF Formulae.
  - Find and interpret the gradient curl, divergence for a function at a given point.
  - Evaluate integrals by using Green's Theorem.
  - Describe the various forms of equation of a Sphere.
  - Find equation of Cone and Cylinder.
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### **B.Sc. II Paper V: Course Outcome of Advanced Calculus**

Students will able to

- Define different types of sequence.
- Discuss the limit of sequence.
- Prove properties of convergent and divergent sequence.
- Verify the given sequence in convergent and divergent by using behaviour of Monotonic sequence.
- Give examples for convergence, divergence and oscillating series.
- Discuss the behaviour of the geometric series.
- Prove theorems on different test of convergence and divergence of a series of positive terms.
- Verify the given series is convergent or divergent by using different test.
- Define and evaluate the limits of functions of several variables.
- Decide whether a function of several variables is continuous or not at a given point or a set of points.
- Compute the maxima and minima of various functions.
- Define double integral and repeated integrals of a real-valued function of two variables.
- Define and evaluate double integrals over some special types of regions.
- Compute double integrals using polar co-ordinates.
- Define the triple integral of a real-valued function of three variables.
- Evaluate triple integrals using repeated integrals.
- State and prove Gauss and Stoke's theorem.

### **B.Sc. II Paper VI: Course Outcome of Elementary Number Theory**

Students will able to

- Define divisibility.
- Illustrate the Division and Euclidean Algorithm
- Discuss Greatest common divisor and Least common multiple.
- Describe the properties of prime numbers
- State and prove unique factorization theorem.
- Show that every positive integer can be expressed as product of prime power in unique way
- Write a formula for the number of positive integers less than  $n$  that are relatively prime to  $n$
- Define congruences and describe the properties of congruences
- Solve the system of linear congruences
- State and prove Chinese Remainder Theorem.
- Discuss special functions.

- Evaluate primitive roots.
- Compute quadratic residues.

### **B.Sc. II Paper VII: Course Outcome of Modern Algebra: groups and rings**

Students will be able to

- Define and give examples of group, subgroup.
- Compute properties of group.
- Find permutation group.
- Check if the intersection, union and product of two subgroups is a subgroup.
- Describe the structure and properties of cyclic groups.
- Verify whether a subgroup is normal or not,
- Obtain a quotient group corresponding to a given normal subgroup.
- Define normal subgroups, quotient groups and index of a subgroup.
- Define homomorphism, kernel of a homomorphism, isomorphism.
- Prove the fundamental theorem of homomorphism for groups and Isomorphism theorems.
- Define and give examples of rings.
- Derive some elementary properties of rings from the defining axioms of a ring.
- Give examples of subrings and ideals of some familiar rings.
- Check whether a subset of a ring is a subring or not.
- Check whether a subset of a ring is an ideal or not.
- Define and give examples of quotient rings.
- Check whether a function is a ring homomorphism or not.

### **B.Sc. II Paper VIII: Course Outcome of Classical Mechanics**

Students will be able to

- Understand constraints D' Alembert's Principle and Lagrange's equations .
  - Solve the one-body problem and central orbits and equations of motion .
  - Understand Kepler's Laws of Motion and Virial theorem.
  - Find functional and extremals.
  - Prove Euler's equation and give examples.
  - Compute Hamilton's Principle.
  - Understand Least action Principle.
  - Find Generalized coordinates, finite and infinitesimal rotations.
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### **B.Sc. III Paper IX: Course Outcome of Mathematical Analysis**

Students will be able to

- Define the Riemann Integral of a function derive the conditions of Integrability and determine the class of functions which are always integrable.
- Discuss the algebra of integrable functions
- Compute the integral as a limit of a sum.
- Learn the mean value theorems of integrability and their applications.
- Understand Improper Integral and their convergence.
- Prove different test of convergence of integrals.
- Understand the significance of differentiability for complex functions and be familiar with the Cauchy-Riemann equations.
- Determine whether a given function is analytic.
- Define Bilinear transformation, cross ratio, fixed point.
- Write the bilinear transformation which maps real line to real line, unit circle to unit circle, real line to unit circle.
- Define and recognize the concept of metric spaces, open sets, closed sets, limit points, interior point.
- Define and Illustrate the concept of completeness

### **B.Sc. III Paper X: Course Outcome of Mathematical Methods**

Students will able to

- Define a recurrence formulae for  $P(x)$  and  $J(x)$ .
- Classify Bessel's and Legendre's equations.
- Find Fourier series expansions for given functions.
- Find Cosine and Sine series expansions for given functions.
- Understand the concept of Laplace transform and their applications
- Determine application of Laplace transform.
- Determine Fourier Sine and Fourier Cosine transform.

### **B.Sc. III Paper XI: Course Outcome of Linear Algebra**

Students will able to

- Define Vector Space, Quotient space Direct sum, linear span and linear independence, basis and inner product.
- Decide whether a given set of vectors in a vector space is linearly independent or not.
- Determine whether a given subset of a vector space is a basis of the vector space or not.
- Construct a basis of a finite-dimensional vector space;

- Obtain and use formulae for the dimensions of the sum of two subspaces, intersection of two subspaces and quotient spaces.
- Discuss the linear transformations, rank, nullity.
- Find the characteristic equation, eigen values and eigen vectors of a matrix.
- Prove Cayley- Hamilton theorem, Schwartz inequality, Gramschmidt orthogonalisation process.
- Understand Modules and its properties.

### **B.Sc. III Paper XII: Course Outcome of Graph Theory (Optional)**

Students will able to

- Identify different ways of representing a graph.
- Identify complete graphs, paths, cycles.
- Obtain the union and complement of a graph.
- Write the degree sequence of a graph and obtain the number of edges of a graph using the degrees of vertices.
- Identify graphs isomorphic to a given graph.
- Distinguish induced subgraphs from the given set of subgraphs.
- Determine cutset and circuit.
- Distinguish between walks, paths, circuits and cycles in a graph Identify Connected graphs, Bipartite graphs, Trees.
- Understand vector space associated with graph.
- Determine Incidence matrix and Adjacency matrix of graph.

### **B.Sc. III Paper XII: Course Outcome of Special Theory of Relativity (Optional)**

Students will able to

- Discuss postulates of special theory of relativity.
  - Understand Lorentz transformation and its geometrical interpretation.
  - Determine the Lorentz contraction Factor.
  - Determine the Length contraction, Time dilation.
  - Understand Four dimensional Minkowskian space-time of relativity
  - Determine Lagrangian and Hamiltonian.
  - Derive Maxwell's equations of electromagnetic theory in vacuum.
-

## **Department of Computer Science**

### **Course Outcomes (Cos)**

**CO1** Identify the fundamental concepts of computer and apply the basic C programming with the concepts of Data Structures and Operating System.

**CO2** Demonstrate the principles of object oriented programming with C++ and Advanced C++ and understand the concepts of web technology and web designing.

**CO3** Understands the RDBMS principles and Visual Basic with its Advance concepts.

## **B.Sc. (Computer Application)**

### **Course Outcomes (Cos)**

**CO1** Understands the basic concepts of internet and identify & apply the C programming language and HTML

**CO2** Understands java programming with oops concepts and identify the software aspects of computer systems

**CO3** Understands the Advanced java with asp programming.

## **Department of Marathi**

### **Course Outcomes (COs)**

Literal sense

After completing this course, students will be able to grasp the following ....

1. Saint Dnyaneshwar Maharaj demand for universal happiness
2. Saint Chokhamela's poetry as an idol of Dalit pain.
3. Rebel saints of the 16<sup>th</sup> century
4. Salient features of Saint Ramdas' Dasbodh
5. Depiction of Varadhi dialect in the poems of Vithal Wagh
6. Salient features of the classics of Madhukar Wakode

# Department of Commerce

## Bachelor of Commerce (Accounting & Finance)

### Course Outcome:

The graduates will get hands on experience in various aspects acquiring skills for Marketing Manager, Selling Manager, over all Administration abilities of the Company. The students will possess the knowledge, skills and attitudes during the end of the B.com (BAF) degree course. By virtue of the training they can become a Manager, Accountant, Management Accountant, cost Accountant, Bank Manager, Auditor, Company Secretary, Stock Agents, Government jobs etc.

## Bachelor of Commerce (Grant in aid Course)

### COURSE OUTCOMES (COs)

At the end of the B.Com Programme, Graduate will be able to.....

**CO-1** Have comprehensive knowledge of Accounting, Taxation, and Management & Business Law.

**CO-2** Proficient with professional, ethical, social, interpersonal & entrepreneurial skill.

**CO-3** Prepare for Higher Studies & to achieve corporate & entrepreneur Success.

**CO-4** Learn & gear up with theoretical knowledge in implementing business practice.

## DEPARTMENT OF ENGLISH

### • COURSE OUTCOMES ( UG-LEVEL)

**CO 1:** Students are able to make accurate use of English Language in their respective fields.

**CO 2:** Students utilise those values in the society which they learnt through literature.

**CO 3:** Students could express themselves in oral and written communications.

**CO 4:** Students are able to use English Language effectively and accurately in formal and informal situations of life.

**CO 5:** Students are able to write Letters of applications, Business Letters, E-mails, News-report, Essay, Resume, review, etc.

## DEPARTMENT OF COSMETIC TECHNOLOGY

### Course Outcomes

**CO1.** Describe purpose and meaning of cosmetics.

- CO2.** Write down classification and characteristics of cosmetics.
- CO3.** Describe raw materials used to design cosmetics.
- CO4.** Describe and evaluate concept of cosmetic safety.
- CO5.** Prepare various types of emulsions and suspensions.
- CO6.** Identify types of emulsions.
- CO7.** Identify herbal drugs used in cosmetic formulations.
- CO8.** Write down adulteration of natural products.
- CO9.** Describe structure and function of skin, hair, nail, and tooth.
- CO10.** Determine blood group, bleeding time, clotting time and hemoglobin concentration of blood sample.
- CO11.** Describe purpose of computer application.
- CO12.** Describe purpose of statistics in research.
- CO13.** Write down classification of fixatives.
- CO14.** Describe cosmetic fragrances.
- CO15.** Create and evaluate skin care, hair care and body cosmetics.
- CO16.** Classify colors, dyes and pigments.
- CO17.** Describe visible spectrophotometry, I.R. spectrophotometry.
- CO18.** Write down principles and techniques of chromatography.
- CO19.** Describe concept and perceptives of Human Resource Management.
- CO20.** Write down marketing management.
- CO21.** Describe production management.
- CO22.** Describe the novel drug delivery system.
- CO23.** Write down the sources of raw materials and their use in formulation of perfumes.
- CO24.** Write down importance of quality control in cosmetic preparations.

## **Department of Computer Application (BCA Course)**

### **BCA-I SEM-I**

#### **1) 1ST1-COMPUTER FUDAMENTAL**

- 1) The Subject teaches about the computer,block diagram devices of computer like input and output,memory.
- 2) It also teaches the number system and basic programming concept.

## 2) 1ST2 C Programming

This subject is the basic programming language giving students an idea of History of c prog,basics of c operators,Structure and how to write basic c program.

## 3) 1ST3 D.T-I

1) The subject learning outcome is number System,its conversion into different number system,Boolean algebra,etc.

2) It also helps in learning the basic logic gates, logic families,ALU,and Combinational logic circuit.

## 4) 1ST4 NM

1) This subject is used to improved numerical ability of the student.

2) Subject outcome is based on numerical methods to find root of equation and Solving simultaneous equation.

## 5) 1ST5 DM

1) The subject learning outcome is Function and recurrence relation. Set operations, Generating Functions, Relation and Boolean Algebra.

## 6) 1ST6-COMMUNICATION SKILL

1) The subject prepares the student for the English Grammar,types of written communication and creative writing.

## BCA-I-SEM-II

### 1) 2ST1 OS

1) The subject teaches about the os,basics of o.s.,Functions of o.s.,File management and Memory Management .

### 2) 2ST2 Advanced C

1) The subject deals with the advanced part of c-program. Like string handling, function in c, Structures, File handling, and error handling.

**3) 2ST3 DT-II**

1) The subject teaches the digital electronics part of multivibrators, flip flops, counters, shift registers, memory, converters, etc.

**4) 2ST4 N.M**

1) This subject is used to improve the numerical ability of the student.  
2) Subject outcome is Regression analysis, Interpolation and numerical Integration.

**5) 2ST5 D.M.-II**

1) The subject's learning outcome is graph theory. This subject is completely based on graph theory.

2) This subject helps students to understand concepts of graph theory and trees.

**7) 2ST6 C.S**

1) Advance grammar, Analytical ability, Drafting of reports and letters and how to write on topics and short notes.

### **BCA – Sem III**

**3ST1: Data Structure(D.S.)**

The subject teaches about general algorithm, Arrays, Stacks, Recursion, Queues and Linked List, Trees and also teaches student about sorting techniques of data.

**3ST2: OOP with C++**

1. It deals with teaching students about OOPS concept, Control Structure, Virtual Function and Polymorphism.
2. Student becomes aware about Complex Programming.

**3ST3: Database Management System (D.B.M.S.)**

1. The subject teaches about the basic concept of database management, Relational model, SQL, Functions and Block structure.
2. Prepares student for back-end Database Structure Management.

**3ST4: Advanced O.S.(AOS)**

The subject teaches about advanced O.S. Concept; Process Management, Concurrent Programming, Storage management, Virtual Storage Management, Processor Management etc.

**3ST5: Electronics**

1. The subject teaches about the microprocessor, its architecture, Instructions and Program of 8085 and 8086, Interfacing and evaluation.
2. Gives the hardware knowledge to students.

## **BCA - Semester IV**

**4ST1: System Analysis Design and MIS (SADMIS)**

1. The subject teaches about project Management, basics of system design, Different parameters, MIS- its characteristics, functions, structure and classification.
2. Also information about System Planning.

**4ST2: Visual Basic (V.B.)**

1. It is a Programming language which teaches student the basic of Programming in V.B.
2. The subject makes student proficient in Event Driven Programming concept. In VB, Internal Functions, and operation of files in V.B.

**4ST3: Web Designing and Office Automation**

1. The subject gives knowledge about information technology, excel, Access.
2. It also teaches student about web tools, basic of web page design, HTML-4, and introduction to Dream viewer, E-Commerce

**4ST4: Networking**

This subject teaches the basic of Network like Network concept, types of network, Digital and analog data transmission, types of Communication Services.

**4ST5: Advanced Microprocessor and Microcontroller**

1. This subject teaches microcontroller, 80286, 80386, 8051 instruction set.
2. It Give knowledge to students about Hardware Programming Interfacing.

## **BCA SEM-V**

**5ST1-CORE JAVA**

This subject teaches the students about fundamental of core java like classes and inheritance, Package And Interface, Exception Handling And Threads, Applete, Awt, Gui Components Etc.

**5ST2-NETWORK SECURITY**

This subject outcome is to teach students about the importance of security ,security trend, encryption techniques ciphers, public key cryptography and RSA MODEL. It also teaches students about IP security architecture and web security.

#### 5ST3-SOFTWARE ENGINEERING

The subject\_\_teaches about software development life cycle including designing,analysis,coding,testing and maintenance of software. It also teaches concepts of software project management and software quality management.

#### 5ST4-COMPUTER GRAPHICS

It teaches students about the basics of generating computer graphics ,geometrical transformation, drawing algorithms, animations, techniques and its implementation in c programming.

#### 5ST5-E-COMMERCE

This subject gives students, introduction to E-commerce, electronic markets, electronic payments etc.

It also explains Business strategies realated with it and other business models like B2B EC, etc.

## **BCA SEM-VI**

#### 6ST1-.NET USING ASP

The Subject Teaches Student About The Most Widely Used Programming Language I.E. Net Using Asp, It Teaches The Application, Explanation Of C# .Net, Working With Ado.Net And Advanced Concepts Of Asp.Net.

#### 6ST2-.CLIENT SERVER TECHNOLOGY

This subject teaches the uses of client –server technology, fundamentals of clients server design, division of lab our, techniques and protocols, scheduling implementations, semaphores.

#### 6ST3-MULTIMEDIA AND ITS APPLICATION

The subject focuses on the definition of multimedia and its uses, its application-hardware and software .

It teaches tools for multimedia, linking multimedia object etc.

It also teaches production building blocks, animation, video, recording formats etc.

It also deals with multimedia project development and case studies.

#### 6ST4-SOFTWARE TESTING

The subject teaches the principles of testing,white box testing,integration testing, acceptance testing, regression testing,test planning, test cases, test summary report etc.

#### 6ST5-ADVANCE DBMS

The subject teaches advanced concept of DBMS like ,file organization,physical database design and tunning, concurrency control transactions and schedule, crash recovery.

It also teaches about parallel and distributed database object database systems,data warehousing concepts and data mining.

## **Department of Psychology**

### **COs of the course ‘Fundamentals of Psychology’**

**The course enables the students to .....**

- CO 1. Describe the historical perspective of Psychology?
- CO 2. Importance of various schools in psychology in understanding human behavior.
- CO 3. Describe various methods in Psychology.
- CO 4. Classify various types of attention.
- CO 5. Classify various determinants of perception and attention.
- CO 6. Illustrate different methods of learning.
- CO 7. Elucidate problem solving strategies and impediments in problem solving.
- CO 8. Describe various stages of memory and methods to measure memory.
- CO 9. Illustrate various theories of forgetting.
- CO 10. Describe motivational cycle and types of motives.
- CO 11. Elucidate theories of emotion.
- CO 12. Describe various types of intelligence.
- CO 13. What are the determinants of personality?
- CO 14. Describe various theories of personality development.

### **Cos of the course ‘Introduction to Positive Psychology’**

- CO 1. Differentiate between positive and traditional psychology.
- CO 2. Describe the assumptions and goals of positive psychology.
- CO 3. What is psychology of well being?
- CO 4. Describe connection between positive emotions and well being.
- CO 5. How to cultivate positive emotions?
- CO 6. What is resilience?
- CO 7. Elucidate how personal goals as windows to wellbeing.
- CO 8. Describe the traits that makes trait positive.
- CO 9. Importance of self regulation and self control in well being.
- CO 10. Cite everyday explanations for self control failure.

### **Cos of the course ‘Psychology: Applied to Healthy Life’**

- CO 1. Describe the status and importance of applied psychology in Indian context.
- CO 2. Describe the role of real self and ideal self in adjustment.
- CO 3. What are health hazards?
- CO 4. Describe General Adaptation Syndrome model.
- CO 5. Describe the methods of stress management.
- CO 6. What is halo effect and devils effect?
- CO 7. Describe the importance of first impression.
- CO 8. What are various types of anxiety based disorders?
- CO 9. Describe various types of schizophrenia.
- CO 10. Cite clinical picture of schizophrenia.
- CO 11. Describe various types of mood disorders.
- CO 12. Classify different types of personality disorders.
- CO 13. Describe characteristics of good psychological test.
- CO 14. What are different types of reliability?
- CO 15. What is test validity? Describe different types of validity.

# **Department of Management**

## **COURSE OUTCOME : BBA**

By fulfilling all course requirements for the bachelors of business administration, students can:

- Describe, explain, and apply fundamental concepts and relationships underlying accounting, economics, finance, management, marketing, and human resource management.
- Apply information technology and use the information to support business processes and make decisions.
- Identify the theories and practices of business ethics and social responsibility.
- Apply quantitative skills to analyze and solve business problems and discover opportunities.
- Communicate verbally and in writing about business topics.
- Function effectively as team members.

## CO of Post-Graduate Courses

### Department of Botany

#### CO of M.Sc. Botany:

##### Paper-I to IV Botany

Students are reintroduced with the detail concept and mechanism of different topics like Apoptosis, Ex-situ Conservation water blooms and Homeotic mutants in *Arabidopsis thaliana* along with the chromosomal morphology and Karyotype analysis of the plants.

##### Paper-I to IV Botany

Re-understand the basic concept of Cytogenetics like polyploidy, study the various fungi like, Morchella, Agaricus, Asperigillus etc. Also understand the context of physiological function of plant in relation to various types of stresses. The students studies biosynthesis of important amino acids and their role in stress resistant mechanism like proline metabolism in plant.

##### Paper-I to IV Botany

Students get better understanding of the morphological, Anatomical and taxonomic studies of phanerogams. Learnt the laboratory skills for doing and understanding practical knowledge related to the protein, DNA and genetic engineering. they got detail in site of Some of the important aspects of plant tissue culture along with the techniques of gene cloning and Agrobacterium mediated gene cloning.

##### Paper-I to IV Botany

Students are acquainted with the knowledge regarding the biosphere and ecosystem. Their interest developed towards the environment, while studying the pollution. Along with that they also learnt the phenomenon of bioremediation and phyto-remediation. they also studied the aspects of economical botany.

### Commerce Department

#### M.Com.

**Course Outcome (CO):** This course is a notch higher than Bachelor degree in Commerce and helps build an in-depth knowledge about Commerce & Management Techniques. It is a specialized course which prepares an individual for career in Finance & Corporate sector. This course serves the needs of Managerial Cadre in Business & Industry.

### Department of Management

#### COURSE OUTCOMES : MBA

- Demonstrate the knowledge of management science to solve complex corporate problems using limited resources

- Apply ethical principles and make ethical choices .
- Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
- .Communicate effectively with all stakeholders of his role as a manager.
- Engage in independent and life-long learning .

#### **COURSE OUTCOMES : MCM**

- MCM program has been designed to prepare graduates for attaining the following program outcomes:
- An ability to apply knowledge of computer science and management to develop computer applications. It can use modern computing tools and techniques to design a computing system which can meet desired needs within realistic constraints such as safety, security and applicability.
- An ability to communicate effectively and present technical information in oral and written reports and to utilize the computing knowledge efficiently in projects with concern for societal, environmental, and cultural aspects. It can also be used to create and design innovative methodologies to develop multiple as well as special purpose software.

#### **Course Outcome : MHRD**

- The course has been encapsulated with the general management principles along with the communication skills. This helps in forming a wide knowledge base and equips students with application oriented approach.
- The course also makes students prudent in the application of organizational behavior in the company.
- The training and development practices were learnt by students. It is essential to see how training feedback system works and for this purpose students visited different organizations in Amravati as well as other cities of Maharashtra.
- How social responsibility is responsible is essential, to see this they studied the projects undertaken by different business houses in Amravati city.
- The student acquires various laws which are to be observed in performing the day to day business. The emphasis is on the different latest provisions of the law and how those laws can be used in best interest of the organization.

## Department of Computer Science

### Course Outcomes (COs)

#### CO1

Understands the Operating System principles, Communication and Networking, Digital Systems in Electronics, and Data Structures and Identify the C# programming, JAVA programming

#### CO2

Demonstrate the Principles of Machine Learning with Prolog Programming, Distributed operating system, Compiler Construction concepts, Computer Graphics Principles, And Design and Analysis of Algorithms.

## Department of English

- *COURSE OUTCOMES (PG-LEVEL)*

**CO 1:** Students are able to become familiar with the nature of literary canons and canon-formation.

**CO 2:** Students employ the knowledge of literary traditions to produce imaginative writing.

**CO 3:** Students are capable of demonstrating knowledge of the major movements, authors and canons of literature in English from the medieval period through the present.

**CO 4:** Students are capable of developing complex reading, writing and research skills.

**CO 5:** Students are able express their thoughts effectively in a variety of forms,

## Department of Zoology

### Course Outcomes (PG)

#### M. Sc.I

#### (Zoology)

#### Semester I

##### Zoology Paper I

#### Animal Structure and Function NonChordata

1. Study the basic concepts of biosystematic taxonomy, history of classification, trends in biosystematics, chemotaxonomy, cytotoxicity, molecular taxonomy and classification from proteista to phylum echinodermata.

2. Learn the dimensions of speciation, taxonomic characters They can understand and easily differentiate with other animals.

3. Learn the cladistic methods of classification, also understand the difference in the application of phenetic and cladistic classification and their phylogram and cladogram.

4. Understand the feeding and digestion, mode of digestion from Bryozoans, protozoan's, other invertebrate species and Echinodermata.

5. Study the micro- morphology and mechanism of movements, hydrostatic movement and insect flight mechanism.

6. Study the organs of respiration in invertebrate and respiratory pigments their functions as well as mechanism of respiration specially in Molluscs and Arthropodan species.
7. Study the excretory organs structure and their functions from Protozoans to Echinodermata and they can know that how this system originates.
8. Study of general organization of nervous system and also the sense organs their morphology and functions
9. Learn the reproductive organs mechanisms, types, parthenogenesis and functional variations of reproductive system in non-chordate.

## Paper II

### Animal Structure and Function( Chordata)

1. Study the different kinds of taxonomic characters, taxonomic procedures, taxonomic keys their merits and demerits. They can differentiate characters of chordate and nonchordate.
2. Study the interpretation and application of important rules, formation of scientific names of various taxa and taxonomic categories.
3. Understand the vertebrate integument like mammalian skin, derivatives of skin their structure and functions
4. Learn the structural and functional organization of digestive system from class protochordate to class mammalian.
5. Learn the characteristics, organ structure their functions as well as accessory respiratory organs.
6. Understand the organ structure and functional organization of vertebrate excretory as well as of nervous system. They can understand morphological adaptation for echolocation in Bat, lateral line system in fishes, Electroreception in different animals
7. Learn flight, aquatic adaptive radiation in mammals. They can also know the migration in birds and fishes and assume that how and why people and animal disperse.

### Practical (paper I and II)

1. Learn and observe the available specimen of invertebrate and vertebrate. Sketching of the specimens on record and power point demonstration of dissected some selected animals so students can understand the internal body organ structure and system.
2. Mounting of some selected body parts of some animals.
3. Understand the taxonomy of animal specimens and charts available in the laboratory representing the different orders of nonchordata and chordate.
4. Students can prepare permanent stained slide as well as observe the mammalian histological slide to know the microscopic structure.
5. Learn

### Practical

1. Students learn observations of available specimens, classification up to classes and sketching of the specimens from phylum protozoa to Hemichordata with the help of charts, and they learn their habits and habitat.
2. Understands internal body parts of the animal when they observe the demonstration of the specimens on PowerPoint presentation in the laboratory.
3. Learn and observe the culture of Paramecium and Volvox.

4. Detected and Mounted of selected body parts of some animals very carefully.

M.Sc I Sem I  
Zoology  
Paper III  
Gamete Biology

1. Study heterogamy in Eukaryotes specially Morphology, Differentiation , Function of Leydig cells.
2. Study Morphology, Endocrinological Aspects of ovarian follicular growth and differentiation.
3. Understand internal and external fertilization they can understand reaction of sperm and reaction of egg.
4. Understand creating multicellularity during cleavage divisions,types gastrulation and formation of germ layers in animals.
5. Learn and they can understand Genomic imprinting is an epigenetic phenomenon that causes genes to be expressed in a parent-of-origin-specific manner in different animals.
6. Understand Assisted Reproductive techniques with the help of powerpoint presentations like Invitro fertilization, ICSI, GIFT and also known disadvantages of ART.
7. Study the procedure applications of transgenic animals with varios examples.
8. Study procedure and applications of gene knockout technology and gene therapies with the help of Ex and In vivo gene therapy, they can also Antigens and Antisense therapy so they can assume these biotechnological techniques useful in increase commercial products as well as useful for cure some gene related diseases.

1. Understand types of cell speciation, cell commitment and differentiation.
2. Study germ cell determination in nematodes, insects and amphibians and germ cell migration in amphibians, reptiles, mammals and birds.
3. Study Body Axis and gene pattern formation in drosophila, amphibian and chick. They can understand establishment of body axis formation in birds and mammals.
4. Study Homeobox concept in different phylogenic group.
5. Study Malformation, disruption, Teratogenic effect of Xenobiotics.
6. Understand the changing evolution through development modularity, developmental constraints, and basic evolutionary mystery.
7. Understand Birth population control measures in male and female.
8. Understand biology of chromosomal and genetic basis of sex determination in mammals and Drosophila. They can understand secondary and environmental sex determination.
9. Study regeneration process with the help of different animals.
10. Study in details on Stem cell, stem cell disorder, stem cell and diabetes.

Practical (paper III and IV)

1. Understand morphology and histology of non-chordata and chordate ovary and testis specially observed permanent slides of insect, snail,frog and rat under binocular light microscope.
2. Observed permanent stained slides of Oogenesis and spermatogenesis of rat.

3. Study different types of eggs on the basis of their yolk content.
4. Collected frog and toad spawn from nearby area for the study of developmental stages.
5. Study of cleavage in limnea in laboratory.
6. Study development of amphioxus, frog, chick with the help of slide and whole mount.
7. Observed developmental stages of chick embryo by incubation in the oven.
8. Study Semen analysis so they can understand normal and abnormal sperm count.

1. Study of histological endocrine glands of vertebrate. They can assume the role of hormones in human being.
2. Understand that the role of neurotransmitter melatonin in the Jet-lag and sleep disturbance as that is ant-oxidant.
3. Learn histophysiology of endocrine placenta, testis ovaries as well as Islets of Langerhans. They can understand that the islets of Langerhans cell secrete secretion called insulin decrease blood sugar level.
4. Understand classification of Hormones like peptides, Steroides and derivatives of amino acids.
5. Study the hormone action at cellular and genetical level.
6. Understand that the hormones are helpful in biological clock, digestion process, growth, reproduction Carbohydrates, lipid, and protein metabolisms.
7. Study synthesis transport metabolism of steroid hormones, epinephrine, insulin, prostaglandins.
8. Learn thyroid hormone its disorders and pituitary and adrenal gland hormones and disorder.
9. Understand the diseases, their symptoms diabetes type 1 diabetes type 2. Diabetic kidney problems, Diabetes and pregnancy, diabetic nerves problems and autoimmune problems.
10. Understand neuroendocrine mechanisms insects, crustacean, amphibia and they also understand the evolution of hormone.

1. Understand the physical, biotic abiotic environment and they can also understand the biotic and abiotic environmental interaction.
2. Study of characteristics, population growth curves, population regulations r and k selection, concept of metapopulation diversity index Simpson's index and Shannon's index.
3. Understand species interaction, types of interaction interspecific competition and Symbiosis.
4. Learn the nature of communities, communities structure and attributes.
5. Study ecological succession types, mechanisms changes involved in succession.
6. Learn energy flow mineral cycling, primary production decomposition.
7. Study structure and function of some Indian ecosystems like terrestrial, aquatic and marine water.
8. Understand success, nature effects of Air pollutants. and also they can understand sources nature and effects of water, air, pollution, Global warming, global climate change. Global dimming.
9. Understand major divers of biodiversity change and also understand conservation biology such as sanctuaries, National parks, tiger projects.

10. Understand metabolism and effects of organochloro, organophosphate and carbamate pesticides, alkaloids cyanides.
11. Understand inter government policy, protocol, for climate change.
12. Understand environmental protection energy also laws, legislation pertaining to environment, Environmental impact assessment processes.

1. Study the rate of oxygen consumption by aquatic animals.
2. Study anatomical & histological permanent slides of endocrine glands in vertebrates, insects.
3. Understand the estimation of total hardness & nitrate contents of different samples of water.
4. Learn determination of LC 50/ LD 50 and 95% confidence limit of any toxicant determine from aquatic organisms.

1. Understand basic features phenotypic effects of mutation they can understand mutational changes at molecular basis of gene, such as induces mutation by chemicals and radiation.
2. learn mutational changes in DNA replication, hot spots of mutation. They can understand detection of mutagens with the help of Ames test and also DNA repair mechanism.
3. Understand the agents and mechanisms of somatic cell fusion with selection of hybrids and chromosomes segregation.
4. Understand epigenetics mechanism they can know mechanisms of DNA methylation in Mammals as well as mechanism of histone modification and polycomb mechanism, epigenetic control of gene activity.
5. Understand the hierarchy in genome organization and mobile DNA as well as genetics of cancer like benign and malignant tumors?
6. Understand the Human karyotypes banding, dosage, compensation and numerical abnormalities of human chromosomes and related syndromes. Like Edwards syndromes, Turner's syndromes. etc.
7. Understand structural abnormalities of human chromosomes and related syndromes like deletion, Robertsonian translocation, Cri-du-chat syndrome Prader-Willi syndrome, Williams syndromes etc.
8. Understand human metabolic disorder they can also understand phenylketonuria, Leach-Nyhan syndrome thalassemia Parkinson's disease.
9. Understand mitochondrial DNA and human diseases they can understand carrier detection fetal analysis. And pedigree analysis.

1. Understand microbial genetics that is information of bacterial chromosome, Bacterial transformation, conjugation transduction, types of bacteriophages and extra chromosomal inheritance through mitochondrial genes, maternal inheritance of kappa particles in case of paramecium and shell coiling in limnaea.
2. Learn introduction to Drosophila genetics its advantages and as a model organism for genetic studies. They can also understand polytene chromosomes their polytenisation process, significance bands and interbands, chromosomal puffs, regulation of chromosomal puffing activity induction of puffs by stress.

3. Understand behavioral traits like mutants, tools and methodologies for genetics analysis as well as genetics and molecular basis of behavioral traits in drosophila.
4. Understand a principles, procedure and applications of DNA finger printing they can also understand chromosomes painting, flow cytometry, DNA sequencing method, polymerase chain reaction.
5. Understand models of lambda phage, E. coli, C.elegans drosophila and human genome analysis. They can also understand functional genomics.
6. Study the genetic variation in natural populations its phenotypic variation, polymorphism of chromosomes structures their variation at molecular level. They can understand principles of Hardy- Weinberg of genetic equilibrium, genetics drift, geneful they can also understand ecological significance of molecular variations.
7. Study the genetics of quantitative traits in populations such as molecular analysis of quantitative traits genotypes-environmental interactions and in breeding depressions and heterosis.
8. Understand methods of phylogenetics tree reconstruction and neucliec acid phylogeny like DNA-DNA hybridization, restriction enzymes sites.
9. Study the protein phylogene mitochondria DNA and evolution and molecular clock.

1. Study the Barr bodies in human female leucocytes they can understand the Barr body is present only in female leucocyte.
2. Study the salivary gland chromosome s in Chironomous or Drosophila larvae so they can understand that the gaint chromosome position or location in the body and structure observed under dissecting microscope.
3. Study of mitosis in cleavage of frog from permanent slides and study of meiosis by using smear method in testis of rat.
4. Learn and prepared human karyotypes by using photograph.
5. Identify the wings and eye mutational change in Drosophila.
6. Study the Extraction of RNA & DNA and they can estimated RNA / DNA spectrophotometrically .
7. Study the problems on genetics based on dihybrid cross sex linked inheritance and blood groups and also understand the various womens genetics traits and genetics disorders.

1. Study the muscle physiology specially on ultra structure of skeleton muscle, Sarcotubular system, Ion distribution, types of contractions, muscle proteins, physical and chemical properties of skeleton muscle. Sliding filament theory. Chemical changes during muscle contraction, roll of calcium iron and ATP.
2. Study the ultra structure of neuromuscular junction and roll of neurotransmitters, and they can understand the symptoms of myasthenia gravis as well as neuromuscular transmission influence by toxins and drugs.
3. Understand muscular disorder like hypotonicity, hypertonicity, red and white fibres and their functions.
4. Study the structure of neuron, electrical properties of nerve, ionic concentration in the cytoplasm local circuit, theory and salutatory conduction.

5. Study the structure of synapse, biosynthesis, storage, electrical events in the post synaptic neuron roll of calcium and types of neuro transmission.
6. Study neurotrophins, growth factors, physiology of imprinting, physiology of emotion, Parkinson disease and Duchenne's muscular dystrophy.

1. study receptors physiology and their pathways they can also understand mechano, photo, chemo, electro, magneto, receptors
2. Study physiology of high altitude and they can assume that effects of acute exposer to high altitude and respiratory changes.
3. Study physiology of exercise and they can understand skeleton muscle blood flow cardiovascular response, blood pressure, endocrine response, metabolic adjustment in exercise.
4. learn the physiology of excretion they can understand histophysiology of excretory organs, urine information, filtration , reabsorption, secretion, and renal physiology.
5. Understand function of aldosterone, renninangiotensin system and roll of kidney in pH regulations and water salt regulation.
6. understand structure and mechanism of pituitary harmones hypothermic hormones, Hormonal function in male and female, foetal physiology.
7. Understand the socio physiology, honey and lac production in insects, pheromones in insects and Mammals.
8. Understand the physiology underline fear and anxiety in animals and parental care in primates.

1. Learn estimation of serum creatinine and urea, Calcium, Phosphorus, sodium, and potassium.
2. Study separation and identification of amino acids by paper and thin layer chromatography.
3. Study the experiment on blood like Erythrocyte sedimentation rate, pack cell volume, mean corpuscular volume and hemin crystal test.
4. Estimated protein, glucose, and cholesterol in blood.

1. Study the physiology of nerves system specially structure and functional compartmentalization of brain and types and structure of reflex Arc.
2. Study the physiology of sleep , physiological changes during sleep, role of neurotransmission in sleep and mechanism of sleep
3. Understand the physiology of learning process and learning and mimicry . They can also understand the organ and physiology of echo location.
4. Study the mechanism and significance of bioluminescence and bioelectricity .
5. Study the homeostasis physiology, water contents and distributions abnormal water, and electrolyte metabolism and water intoxications .
6. Study the intracellular chemical messenger paracrine and autocrine agents.
7. Study the biological rhythms adaptation and acclimatization.
8. Study the basic thermoregulatory mechanism in poikilotherms and endotherms.
9. Study the basic osmoregulatory mechanism in stenohaline and euryhaline species they can understand freshwater, marine water and terrestrial environment
10. Understand mechanism of calcium phosphate, in homeostasis process.
11. Understand liver is important in the storage and homeostasis of iron process.
12. Understand homeostasis mechanism of minerals and antidiuretic hormones.

1. Study the digestion absorption, utilization of protein, Carbohydrates and lipids,.
2. Study histophysiology of gastric gland and secretory functions of the elementary tract. They can also understand the gastrointestinal function.
3. Understand gastrointestinal disorder like Achalasia gastritis pancreatitis and colitis.
4. Study the anatomical and physiological organization of respiratory system, mechanism of exchange of respiratory gases, transport of gases by blood, oxygen dissociation curve, Co2 dissociation curve neurohormonal and chemical regulation of respiration. They can also understand infectious respiratory disease like SARS, Avian Flu, and Swine Flu,
5. Study the anemia and polycythemia, regulation of heartbeats and blood pressure they can understand circulatory and respiratory responses. to extreme conditions and blood pigments, role of oxygen and CO<sub>2</sub> transport and physiological significances.
6. Study the anatomical and histology of Mammilian heart, Cardiac output, Cardiac sound, Cardiac cycle, Pacemaker system,
7. Study the blood pressure and its regulation, factors that affected blood pressures interpretation of ECG, Lymph composition, formation , function and structure of lymph nodes.

1. Study the saliva its isolation and identification of rumen microorganism.
2. Study the estimation of Rumen ammonia and blood urea under various physiological conditions.
3. Study the preparation and examination of blood smear to know the blood cell as well as differential leucocytes count.
3. Study the histochemical demonstration of acid and alkaline phosphatase and separation of protein by paper and gel electrophoresis.
4. Study the qualitative analysis of urea, ketone body and salts.

## **PG Department of Physics**

### **Course Outcomes (COs):**

#### **1. Course: M.Sc. I (Physics) Semester- I**

By the completion of this course, the students will be able to

- CO1:** get the deep knowledge of mathematical physics via study of matrix algebra, complex variables, differential equation of second order, Bessel's differential equation & integral theorem.
- CO2:** understand the ideas of classical mechanics by studying Newtonian mechanics, D'Alebert's principle, angular momentum, constraint, Lagrange equation, cyclic coordinates, central forces, etc.

- CO3:** learn the concepts of quantum mechanics: failure of classical mechanics, general formulation of quantum mechanics, simple harmonic oscillator, zero point energy, pauli spin matrices, symmetry and constants of motion.
- CO4:** Study the computational method and programming.
- CO5:** perform the computational programme through laboratory course I and learn the experimental skill of determination of wavelength, small thickness, etc. through laboratory course II.

## **2. Course: M.Sc. I (Physics) Semester- II**

By the completion of this course, the students will

- CO1:** be expert in the knowledge of electrodynamics by studying Gauss's law & its applications, potential, electric field concepts, electricity and magnetism, time varying fields, etc.
- CO2:** get the basic concepts of quantum mechanics part II via study of time dependent and independent perturbation theory, scattering, systems of particles, radiation theory, etc.
- CO3:** enjoy the study of solid state physics to learn crystallography, diffraction of X-rays, Bragg's equation, reciprocal lattice, specific heat of materials, etc.
- CO4:** understand the basic knowledge of network theorem and solid state devices which includes the study of network analysis, passive components, semiconductor study, rectifier, BJT, amplifiers, and feedback in amplifiers.
- CO5:** be able to get the practical knowledge of determination of  $e/m$ , GM counter study, etc. through laboratory course I and network theorem study and other electronic experiments via laboratory course II.

## **3. Course: M.Sc. II (Physics) Semester- III**

By the completion of this course, the students will

- CO1:** study the radiation and plasma physics through the study of wave equation, Cerenkov radiation, motion of charge particles in electric and magnetic fields, Debye shielding effect, plasma oscillations, cutoff and resonances, CMA diagram and reflection of em waves.
- CO2:** be able to understand the concept of statistical mechanics in details through study of classical & quantum statistics, ideal Fermi-Dirac gas, phase transition, and super fluid, etc.
- CO3:** get knowledge of atomic and molecular physics via study of vector atom model, Raman,

Zeeman, Pachen back effects, molecule types, vibrational modes & energies, etc.

- CO4:** understand the concepts of condensed matter physics and study band structure, magnetism, ferromagnetism, dielectric and superconductivity etc.
- CO5:** study practicals condensed matter physics through laboratory course I and do the project through laboratory course II.

#### **4. Course: M.Sc. II (Physics) Semester- IV**

By the completion of this course, the students

- CO1:** will be able to get the knowledge of nuclear and particle physics. In this, they study properties of nucleus, nuclear forces, beta decay, nuclear models, neutron physics, nuclear detectors, particle physics, etc.
- CO2:** will understand Op-Amp theory and its applications where they get the knowledge of differential amplifier, oscillators, analogue computation, filter circuits, etc.
- CO3:** will get the knowledge of condensed matter physics part II where they study imperfection in crystal, dislocation reaction, interacting electron gas, point defects, lattice disorder and colour centers, etc.
- CO4:** will study the nanoscience and nanotechnology via the knowledge of free electron gas theory, quantization method, carbon nanostructure, quantum well, scanning electron method, etc.
- CO5:** will, in laboratory course I study the practices of Op-Amp and its applications and in laboratory course II they prepare project report by completing project so that they get research knowledge.

## **Department of Chemistry- PG courses**

### **M.Sc. Sem-1**

#### **Inorganic Chemistry**

This course facilitates students to understand fundamental of Stereochemistry and Bonding in Main Group elements, Metal-ligand bonding, Molecular orbital theory of coordination compounds, Boron hydrides & Metal Cluster, Non-aqueous solvent behavior, Metal-ligand equilibria in solution, Symmetry and group theory.

#### **Organic Chemistry**

This course facilitates students to understand fundamental of Nature and Bonding in Organic Molecule, Stereochemistry of organic molecule, Reaction mechanism: Structure and Reactivity, Aliphatic nucleophilic substitution, Elimination Reactions, Aromatic electrophilic substitution, Aromatic Nucleophilic Substitution.

### **Physical Chemistry**

This course facilitates students to understand fundamental of Quantum Chemistry, Surface Chemistry, Thermodynamics, Nuclear Chemistry, Chemical Dynamics, Theories of reaction rates, Unimolecular reactions, Reactions in solution, Solvent effects on reaction rate. Factors determining reaction rate, Numericals.

### **Analytical Chemistry**

This course facilitates students to understand fundamental of Basic concepts of Analytical Chemistry, Purification Techniques, Statistical Analysis, Separation Techniques, Ion-Exchange Separation, Gas Chromatography, High Performance Liquid Chromatography (HPLC), Chemical Safety and Handling of Chemicals, Explosives & Chemical weapons:

### **Outcomes**

Students acquire thorough knowledge of derivations, depictions and problem solving and periodic properties of the elements including the preliminary theories of bonding, preparation methods, and reactivity of inorganic molecules.

### **Practical**

Chemistry is an experimental and applied subject. Hence, practical course inculcates the basic skills required for understanding the concepts and authenticating the basic laws and principles of chemistry & helps in development of practical skills of the students in Organic Synthesis: Single Stage Preparations, Qualitative Organic Analysis, Quantitative Analysis.

, Use of Computer Programs 5 terms of practicals,

M.Sc. Sem-2

### **Inorganic Chemistry**

This course facilitates students to physical properties and fundamental of Electronic spectra, Magnetochemistry, Reaction Mechanism of Transition Metal complexes-I, Reaction Mechanism of Transition Metal complexes-II, Metal pi-Complexes, Metal carbonyls, Metal nitrosyls, Fluxional Organometallic compounds, Bio-inorganic chemistry, Bioinorganic chemistry, Bioinorganic chemistry of Fe, Bioinorganic chemistry of Co.

### **Organic Chemistry**

This course facilitates students to physical properties and fundamental of addition of C-C & C-X multiple bond, mechanism of molecular rearrangement, Free radical reaction, photochemistry, Pericyclic Reactions, green chemistry.

### **Physical Chemistry**

This course facilitates students to physical properties and fundamental of Chemical Dynamics, Quantum Chemistry, Macromolecules, Electrochemistry, Statistical Thermodynamics

### **Analytical Chemistry**

This course facilitates students to physical properties and fundamental of Optical Method, Flame Emission and atomic spectrometry, Water pollution, air pollution, Soil Pollution and Pesticide Analysis, Radiation pollution

### **Practical**

Chemistry is an experimental and applied subject. Hence, practical course inculcates the basic skills required for understanding the concepts and authenticating the basic laws and principles of chemistry & helps in development of practical skills of the students in Use of Computer Programs 5 terms of practicals, Preparation of inorganic compounds by greener methods and their characterization by elemental analysis, MW determination, decomposition temperatures and molar conductance studies.

### **Outcomes**

Students acquire thorough knowledge of derivations, depictions and problem solving and periodic properties of the elements including the preliminary theories of bonding, preparation methods, and reactivity of inorganic molecules,

### **M.Sc. Chemistry (sem-3)**

#### **Spectro Chemistry**

This course facilitates students to physical properties and fundamental of Unifying principle, Microwave spectroscopy, Reactivity and Characteristics of Nanoparticles, Ultraviolet and visible spectroscopy, Infrared spectroscopy, Mass spectrometry, Nuclear Magnetic Resonance Spectroscopy, Characterization of Organic Molecules. Students are introduced to analytical chemistry in which they are made aware of inorganic quantitative analysis (Volumetric and Gravimetric analysis) wherein they study non-instrumental volumetric analysis which comprises of study of various titrations, indicators used in it & some theoretical aspects related with titrations. Along with it they also study error in quantitative analysis & ways to minimize them. They instill skills related to chemical kinetics and physical property measurement.

Students are trained to determine the rate constant of chemical reactions, solubility, heat of neutralization, critical solution temperature of partially miscible system & distribution coefficient.

#### **Analytical Chemistry**

This course facilitates students to physical properties and fundamental of Thermal methods of analysis and thermometric titrations, Thermometric titrations, Electroanalytical Methods, High frequency titrations,

Electrogravimetry, Coulometry. Chemical, biochemical and biosensors, Electroanalytical Techniques, Polarography,

Voltammetry, Related Techniques, Bio-analytical chemistry.

#### **Organic Sp-I**

This course facilitates students to physical properties and fundamental of Oxidation-Reduction, Polynuclear Hydrocarbons, Construction of Ring Systems, Non Aromatic Heterocycles, Formation of C-C bond Principle, Umpolung concept, Phosphours, and sulphur ylide, Enamines. Selective Organic Name Reaction, Modern Synthetic Methods.

#### **Organic Sp-II**

This course facilitates students to physical properties and fundamental of Carbohydrates, Lipids, Amino acids, proteins and peptides, Enzymes, Alkaloids and Terpenoids, Steroids and Hormones, Prostaglandins, pyrethroids, rotenones and pheromones, Vitamins and Natural Pigments

#### **Practical**

Chemistry is an experimental and applied subject. Hence, practical course inculcates the basic skills required for understanding the concepts and authenticating the basic laws and principles of chemistry & helps in development of practical skills of the students, Multistage Preparations, Estimations, Purification of Solvents.

#### **Outcomes**

Students acquire thorough knowledge of derivations, depictions and problem solving and periodic properties of the elements including the preliminary theories of bonding, preparation methods, and reactivity of inorganic molecules.

## **M.Sc. Chemistry (sem-IV)**

### **Spectro-Chemistry**

This course facilitates students to physical properties and fundamental of Raman spectroscopy, Photoelectron spectroscopy, X-ray diffraction, Electron diffraction, Neutron diffraction, Electron Spin Resonance Spectroscopy, Mossbauer spectroscopy, Determination of Structures of Complex Organic Molecules by Spectroscopic

Students are introduced to chemistry of d and f-block elements and metallurgy to understand chemical reactions and processes occurred in metallurgy. They learn colligative properties and their applications and understand the crystalline state in-depth. The emphasis is on learning reaction mechanisms of various organic reactions.

In practical sessions, students get training for using complexometric titrations and spectrophotometric techniques. They learn isolation of natural products like casein from milk, caffeine from tea leaves.

### **Analytical Chemistry**

This course facilitates students to physical properties and fundamental of Radiochemical methods of analysis, Radiation detection and measurement, neutron activation analysis, isotopic dilution analysis, Radiometric titrations, Molecular photofluorescence and phosphorescence spectrometry, Optical Methods & Flow Injection Analysis, Food and Cosmetic Analysis The chemical analysis of food, Analysis of Cosmetics, Analysis of face powder, Analysis of deodorants and antiperspirants, Forensic & Fuel analysis

### **Organic Sp-I**

This course facilitates students to physical properties and fundamental of Application of organometallics in organic synthesis, Organometallic Reagents, Organo transition metal reagents, Designing the synthesis based on retrosynthetic analysis, Protection and Deprotection of functional groups, Phase Transfer Catalysis, Reagents in Organic Synthesis, Heterocyclic Compounds

### **Organic Sp-II**

This course facilitates students to physical properties and fundamental of Polymers, Dyes and Agrochemicals, General aspects of drug, Drugs design. Classification of Drugs- I, Antibiotics:, Antimalarial, Antipyretic and Analgesic, Anti-inflammatory, Sedatives & Hypnotics, Classification of Drugs- II

Antitubercular & antileprotic, Anaesthetics, Antihistamines, Tranquilizers:, Cardiovascular

### **Practical**

Chemistry is an experimental and applied subject. Hence, practical course inculcates the basic skills required for understanding the concepts and authenticating the basic laws and principles of chemistry & helps in development of practical skills of the students in Qualitative Organic Analysis, Scheme of Marking: Type of the mixture, Spectral Interpretation and use of Chem draw software, Miscellaneous Experiments (Mandatory)

### **Outcomes**

Students acquire thorough knowledge of derivations, depictions and problem solving and periodic properties of the elements including the preliminary theories of bonding, preparation methods, and reactivity of inorganic molecules,

## **Department of Mathematics**

### **Course Outcome of M. Sc. Mathematics**

#### **M.Sc. I Paper I: Course Outcome of Real Analysis**

After completing this course, the student will be able to:

- Attain existence of Riemann Stieltjes integral, properties of the integral
- Enumerate the uniform convergence of sequence, different test of convergence.
- Study in detail the Power series.
- Compute the maxima and minima of various functions.

#### **M.Sc. I Paper II: Course Outcome of Advanced Abstract Algebra**

After completing this course, the student will be able to:

- Identify the concept of Normal groups and Quotients groups.
- Analyze Permutation groups and Counting principle.
- Explain Sylow theorem and its applications.
- Provide information on ideals and Quotient rings.
- Concentrate on a particular Euclidean domain, Euclidean domain and other forms of Polynomial rings.
- Discuss Modules, submodules, quotient modules.

#### **M.Sc. I Paper III: Course Outcome of Complex Analysis**

After completing this course, the student will be able to:

- Apply Cauchy's theorem for disk and the Integral formula.
- Study Taylor's theorem, Maximum modulus theorem, Open Mapping Theorem
- Analyze Singularities .
- Understand Laurant series development, Rouche's theorem.
- Study Residue theorem and the argument principle.
- Differentiate the Taylor's series and Laurent series.
- Understand properties of Analytic functions.

#### **M.Sc. I Paper IV: Course Outcome of Topology I**

After completing this course, the student will be able to:

- Attain mastery in Cardinal and Ordinal numbers.
- Locate Connectedness, compactness and continuity.
- Enumerate open sets, closed sets, Topological spaces.
- Study in detail the Seperation and countability axiom.

#### **M.Sc. I Paper V: Course Outcome of Advanced Discrete Mathematics I**

After completing this course, the student will be able to:

- Define Semigroups, Monoids, Homomorphism and Isomorphism.
- Describe the TF statements, connectives, atomic and compound statements.

- Illustrate Tautology, Tautological implication, Truth Tables, Normal Forms, Principal Normal Forms.
- Discuss the theory of inference, quantifiers, predicate calculus.
- Interpret Lattices, Boolean Algebra, Karnaugh Map, Switching Circuits.

### **M.Sc. I Paper VI: Course Outcome of Measure and Integration Theory**

After completing this course, the student will be able to:

- Analyze measurable sets and Lebesgue measure.
- Study Lebesgue differentiation theorem.
- Understand Measures and outer measures.
- Study the Stone-Weierstrass theorem and its applications.
- Describe the Riemann integral and convergence of measure.

### **M.Sc. I Paper VII: Course Outcome of Advanced Linear Algebra and Field Theory**

After completing this course, the student will be able to:

- Discuss Canonical Forms
- Analyze Quadratic forms.
- Discuss Extension fields and Roots of polynomials.
- Understand the elements of Galois Theory.

### **M.Sc. I Paper VIII: Course Outcome of Integral Equations**

After completing this course, the student will be able to:

- Understand Types of Integral Equations.
- Solution of Fredholm integral equation of the second kind with separable kernels.
- Solution of Volterra integral equation of the second kind by successive substitutions.
- Applications of integral equations and Green's function to ordinary differential equations.

### **M.Sc. I Paper IX: Course Outcome of Topology II**

After completing this course, the student will be able to:

- Discuss the connected space, compact space, complete metric space, related theorems on Baire space.
- Know about product space, metrization and par compactness

### **M.Sc. I Paper X: Course Outcome of Advanced Discrete Mathematics II**

After completing this course, the student will be able to:

- Understand the concept of Graphs .
- Know about different trees and cutset.
- Introductory Computability Theory : Finite state machines.
- Define Automata.

- Discuss the Grammers and Language.
- Construct turing machine.