**2.6.1 Program and course outcome for all program offered by the institution are stated and displayed on websites and communicated to teachers and students.**

**Describe COs for all programs mechanism of communication within minimum of 200characters and maximum of 200 words .**

The collage has clearly started learning outcomes of the programs and courses. The following mechanism is followed by the institution to communicate the learning outcomes to the teachers and students:

1. Hard copy of syllabus and learning outcomes are available in the departments for ready reference to the teachers and students.
2. The importance of the learning outcomes has been communicated to the teachers in every IQAC meeting and collage committee meeting.
3. The students are also made aware of the same through tutorial meetings.
4. Orientation programs or workshops have also been conducted for developing the program educational objective and learning outcomes at department …… in collage level.
5. Graduates attributes are described to the first year students at the commence …….. of the program few hours are spent by the teachers introducing the subject to the students.
6. After attainment of the program display and communication specified here:

# website

# Classrooms

# Department notice board

# Laboratories

# meeting/interaction with student and teachers

# parent meeting

# faculty meeting

# Alumni meeting

# Library

1. The course outcomes are communicated to the students by the respective faculty, in addition to this the course outcomes of all subjects.

Lesson plan of a course contain regarding Cos and each class is marked according to the Cos. course outcomes of laboratory courses are published in the respective laboratory and in the lab manual/student lab record.

**B.SC & M.SC. Chemistry Program outcomes**

After completing B.SC/M.SC Chemistry program student will be able to :-

PO1-Its undergraduate and postgraduate program demonstrate and apply the fundamental knowledge of the basic principal in various field in chemistry.

PO2-Create awareness of responsibility to words environment and knowledge to solve the issues related to environment pollution .

PO3-To built up small scale and industry for developing best product and apply various accept of chemistry in natural product isolation such like pharmaceuticals, dyes ,text like , polymers ,petrol pump products , forensic and also to develop interdisciplinary approach of the subject.

PO4-Collaborate effectively on term oriented project in the field of chemistry are other related field .

PO5-Apply the knowledge to develop the suitable and Eco-friendly technology in industrial chemistry .

PO6-Have develop their critical reasoning judgment and communication skill, among students develop research and implementation or the politics to the issues at global and local level.

PO7-The practical lab course done in the laborites in path the knowledge about various chemical relents and reaction theatrically skill and handling the corrosive , poison , explosive and carcinogenic chemicals making them employable in any kinds of chemical industries

PO8-After completion of undergraduate program will prove themselves in different competitive exam like-(Technical Assistant, Chemistry , Administrative job)NTOC, state PSC, UPSC ,IFS, bank PO, Railway and many other power plants / coal mines/ Lab Technicians/ Teacher.

PO9- After completion of postgraduate program in chemistry students can prepare for NET/SET or SLET and various field and also make their carrier through higher studies Ph.D in Chemistry and apply for state level AP.PSC (Assistant Professor, Professors , associate professor ) and make their carrier as a scientist.

**B.SC 1st year Chemistry (Course outcomes)**

**Paper-I(Inorganic Chemistry)**

Course learning outcomes upon successful completion of the course , students will be able to-

Unit-1: To understand the all basic facts of Atomic Structure and periodic properties .

Unit-2: Students will learn the Chemical bonding-I through the basic concepts of ionic bond.

Unit-3:They will understand the covalent bond through chemical bonding-II.

Unit-4: The unit has been designed to give general concepts of S-block elements and P-block elements. To study relationship and preparation , derivations and properties.

Unit-5:This Inorganic Chemistry contains chemistry of Noble gases and to study basic principals involved in the analysis and of cations and anions and solubility products by H2S scheme.

**Paper-II(organic chemistry)**

Course learning outcomes , completion of the course students will be able to :

Unit-1:To understand the all basic concepts of organic chemistry like hybridization , neucleophilicity elimination & addition substitution reactions.

Unit-2: The unit has been design to give an insight into almost all aspects of stereochemistry and to build a solid platform in this specific field.

Unit-3:They will understand the conformation analysis of alkenes.

Unit-4: Students will learn the chemistry of aliphatic hydrocarbons through carbon carbon sigma bonds and carbon-carbon pi bonds.

Unit-5: Able to understand Aromaticity, Electophilic aromatic substitution mechanism through aromatic hydrocarbons.

**Paper-III(Physical Chemistry)**

Course learning outcomes completion of the course , students will be able to:

Unit-1:To learn basic Mathematical concepts for chemist , logarithmic relations and differentiation of functions and know the significant figures and their applications.

Unit-2: Able to understand kinetic molecular model of a gas and behavior of real gases through gaseous state chemistry.

Unit-3: Know the liquid state chemistry and colloids & surface chemistry.

Unit-4: To understand the basic concept of solid state chemistry.

Unit-5: To study and learn about the rate of reaction and catalysis through the chemical kinetics/ catalysis.

**Paper-IV(Laboratory course)**

Course learning outcomes –upon successful learning students will be able to-

In Inorganic chemistry lab work-

1. To analysis of acidic and basic radicals in the given inorganic mixture.
2. To understand Acid-Base titration .
3. To perform & understand redox titration .
4. To understand Iodimetric titration .

**Organic Chemistry**

1. Demonstration of laboratory glassware and equipments.
2. To understand calibration of the thermometer through determine the M.P. of the organic compound’s.
3. To understand purification of organic compounds by crystallization using different solvents.
4. To determination of melting points and boiling points of organic compounds.
5. Determination of the organic compounds through distillation , sublimation. crystallization.
6. To determination of elements and functional group in the given organic compounds.

**Physical Chemistry**

1. To measurement the surface tension and viscosity for a binary liquid mixture.
2. To study Chemistry kinetics and determine the specific rate of hydrolysis at room temperature.
3. To prepare colloidal solution of silver nano particles using capping agents.

**B.sc-II year Chemistry(Course outcome)**

**Paper-I** **(inorganic chemistry )**

Course learning outcomes upon successful completion of the course , students will be able to understand Unit-1:To understand the basic concepts of the chemistry of transition series elements.

Unit-2: To understand the reaction of oxidation and reduction through electro chemical series and to learn IUPAC Nomenclature of Co-ordination compounds and study stereochemistry of complexes .

Unit-3: Explore Co-ordination chemistry, focuses on valence bond theory, crystal field theory & energy measurement of octahedral & tetrahedral Co-ordination.

Unit-4: To study the chemistry of Lanthanide elements and chemistry of actinides learns about general features and separation.

Unit-5: To understand the Arrhenius brensted theory and physical properties of solvent through Acids-Bases and non-aqueous solvents.

**Paper-II(organic chemistry)**

Course learning outcomes upon successful completion of the course :

Unit-1: To learn about the SN1,SN2 and SNI nueleophlic substitution reaction chemistry of organic halides.

Unit-2:To know the concepts of alcohol nomenclature preparation and properties and phenols structure and bonding and to study mechanism of name of reaction.

Unit-3: To understand the nomenclature structure and reactivity of Aldehyde and ketones . To know about the oxidation and reaction naming of organic reaction .

Unit-4:To learn in detail about the preparation , structure and bonding of carboxylic acids and derivation preparation.

Unit-5:To study the organic compounds of nitrogen , and know the detail preparation reactivity , structure and nomenclature amities.

**Paper-III(Physical Chemistry)**

Course learning outcomes upon successful completion of the course students will be able to understand :

Unit-1:To understand the thermodynamic law and to know the law theme chemistry discuss about the bond energy and recourse energy .

Unit-2:To study second law of thermodynamic energy and mathematical concepts of clibbs and holmobolt free energy and calculation absolute energy of molecules .

Unit-3: To learn about the chemical equalizations and ienie equalixation through thermo-oxidation solubility product principal .

Unit-4:To study phase rule component and degree of freedom and know the phase rule to two and three components system henrry law solvent asture.

Unit-5:To study photo-chemistry through electro magnetic radiation , law of photochemistry , example of quantum view and application.

**Paper-IV(Laboratory course)**

Inorganic chemistry

1. To know experimentally analysis of acidic and bisc radiation in the given inorganic mixtures .
2. To learn about volumetric analysis by estimation and the to learn crometography separation of metal ion.

Organic chemistry

1. To determination of elements and functional groups , specific test of the given organic compounds .
2. To learn about the preparation of organic compounds .

Physical Chemistry

1. To know experimentally transition temperature and determination of heat capacity.
2. To learn through experimentally determine the solubility of benzoic acid at different temperature .
3. To know by the experimentally determination of thermo-chemistry.
4. To study the phase equilibrium and molecular weight determination.

**B.SC.III Year Chemistry (Course outcome)**

**Paper-I(Inorganic chemistry)**

Unit-1:To understand metal ligand bonding in transition metal complex ,know the limitation and application of crystal field theory and learn about thermodynamic and kinetic aspects of metal complex .

Unit-2:To study magnetic properties of transition metal complexes and know the coupling and types of electronic transition and spectro-chemical series.

Unit-3:To understand organometalic chemistry , know the organ metallic compounds , carbonyls , preparation and structure and study of the following catalysis by organ metallic compounds .

Unit-4:To study Bioinorganic chemistry through essential and trace elements in biological process.

Unit-5: To understand and learn about hard and soft acids and bases, banding concept clear through principals and know the inorganic polymers types, structure and aspects with application of polymers.

**Paper-II(organic chemistry)**

Unit-1:To study heterocyclic compounds through classification nomenclature ,structure , aromaticity , synthesis reaction mechanism of 5-membered and 6-membered rings containing compounds .

Unit-2:To learn about organ metallic reagent and organic synthesis via enucleate through formation and chemical reaction of the compounds .

Unit-3:To study Bio-molecules containing carbohydrates and amino acid , proteins and nucleic acid , know the classification and nomenclature.

Unit-4:To learn about in detail synthetic polymers and synthetic dyes , know the addition and chain growth polymerization , color constitution and classification dyes.

Unit-5:To deeply study and analysis practices of spectroscopy of IR, UV-Visible and NMR spectroscopy, To understand basic principal and instrumentation and interpretation of spectra of simple organic compounds .

**Paper-III(Physical Chemistry)**

Unit-1:To understand the basic concepts of quantum mechanics through ware equation .

Unit-2: To study quantum mechanics approach of molecular orbits theory and introduced to valence bond theory with models.

Unit-3:To study spectroscopy introduces & characterization of electromagnetic radiation explains and know the vibrational and roman spectrum spectroscopy. Fundamental basic concepts of spectroscopy learn the electronic spectroscopy new concept based electronic spectra.

Unit-4: To study electro chemistry by electrolytic conductance and theory & basic concept of migration of ions.

Unit-5: To understand electro-chemical cell , single electrode potential concentration cell and corrosion types and theory. Know the mathematical concept of EMF, ∆G , ∆H & ∆S for cell reactions.

**M.Sc. Chemistry**

**(Course Outcomes)**

**First-Semester(CBCS)**

**Course code (MSC101) – Inorganic chemistry-I**

After successfully completing this course , students will be able to :-

CO 1 :- Discussion and basic concept learn about the symmetry and group theory in chemistry.

CO 2:- To develop the understanding of evolution of bonding theories metal–ligand bonding in transition metal complexes and understand the model , spectro chemical series.

CO 3 :- To study electronic spectra of transition metal complexes like orgel energy level **Tanabe-Sugano** diagram , Charge transfer spectra and calculation ligand field parameters.

CO 4 :- Understand the magnetic properties of metal complexes.

CO :- Know the metal ligand equilibiria in solution through chelate effect and determination of binary formation constant by pH-metry and spectrometry.

**Course Code (MSC102) -: Organic Chemistry**

CO 1:- To understand the concept of aromaticity and properties of aromatic compounds.

CO 2:- To learn basic knowledge of Necleophilic substitution SN1 ,SN2 ,SNi and SN2’ properties and mechanism.

CO 3 :- Understanding of neigh bonding group participation in organic synthesis and how it play role in organic reactions.

CO 4 :- To understand of Basic ideas of generation of organic synthesis.

CO 5 :- To learn about the basic concept important and application of Asymmetric synthesis.

**Course Code- (MSC103) :- Physical Chemistry**

After successfully completing this course , students will be able to:-

CO 1 :- Represent and to develop the concept of mathematics in quantum chemistry and basic of quantum chemistry .

CO 2:- Understand of the basics of thermodynamics.

CO 3 :- To understand the **Debye Huckel Theory** thermodynamics of electrified interface . Through electrochemistry.

CO 4 :- Understanding of various type of specialized chemical reaction and their kinetics by chemical reaction dynamics. Determination of rate of law.

CO 5 :- To learn the concept of surface chemistry and catalysis including homogeneous and Heterogeneous catalysis.

**Course code (MSC104) -: Theory and Application of Spectroscopy-1**

After successfully completing this course ,students will be able to :-

CO 1 :- To study principles of spectroscopic radiation , electromagnetic interaction and electronic energy levels.

CO 2 :- To learn basic concept of microwave spectroscopy for diatomic and polyatomic molecules.

CO 3:- To understanding modes of vibration for diatomic & polyatomic molecules , through Infrared spectroscopy.

CO 4 :- To study Raman spectroscopy through quantum & classical theories and Instrumentation & application and Raman effect in molecular structures.

CO 5:- To understand the Scattering spectroscopy through electron diffraction spectroscopy and to learn the same spectrophotometer analysis method & Techniques.

**Course Code –(MSC105) :- Lab –Course -1 Chemistry**

The students will be acquire knowledge of :

CO 1 :- To learn qualitative analysis of mixture of salts including rare elements & interfering ions.

CO 2:- To learn understand the qualitative analysis by determination of metal ion by volumetric & gravimetric methods.

CO 3 :- To understand & preparation by the estimation of Boric Acid in Borex , Manganese dioxide in pyrolusite , H2O2 in commercial sample and in other many estimation.

CO 4 :- To study and preparation of selected inorganic compound and their study by IR electronic spectra , ESR , Mossbauer , Handing of air & moisture sensitive compounds.

**Course code –(MSC106) :- Lab Course II Chemimstry**

After successfully completing this course students will be able to:

CO 1 :- To study adsorption & surface chemistry by Gibbs equation & Freundlich and Langmuir adsorption isotherm .

CO 2 :- To learn about phase equilibria & determination of chemical kinetics .

CO 3:- To learn & determination of molecular weight of naphthalene polymers and non-volatile substance .

CO 4 :- To perform the potentiometry pH metry & polarimetry , to know the determination of strength of acid , Redox potential ,Incersion of sucrose.

**M.Sc. second semester (CBCS)**

**Chemistry**

After successfully completing this course , students will be able to:-

**Course Code- (MSC201) :- Inorganic Chemistry**

CO 1 :- To understand the kinetics and mechanism of substitution reaction.

CO 2 :- To study electron transfer reactions.

CO 3 :- To learn the preparation , structure and properties of metal carbonyls and related compounds.

CO 4 :- To understand Inorganic rings chains and clusters .Through metal-metal bonds.

CO 5 :- To study clusters and element-element bonds. Through IUPAC nomenclature , structure , bonding of Boranes.

**Course code – (MSC202) :- Organic Chemistry**

After successfully completing this course , students will be able to-

CO 1:- Understand various addition reaction to carbon-carbon multiple bonds.

CO2 :- To understand various elimination reaction with mechanism & applications.

CO3 :- Understanding of the theoretical basis for pericyclic reaction and the utilization of these reaction in the organic synthesis .

CO 4 :- To understand the basic of photochemistry excitation of molecule by the light various photo- chemical reactions.

CO 5 :- To study of photochemistry of carobonyl compounds.

**Course code –(MSC203) :- Physical Chemistry**

After successfully completing this course , students will be able to :

CO 1 :- To learn angular momentum in Quantum mechanics , variation and perturbation theory .

CO 2:- To study statistical thermodynamics – probability and thermodynamic functions , Heat capacity of solid and many more function derived .

CO 3 :- To learn & study of electro chemistry –II structure of electrified interfaces , overpotential , semiconductor & electro catalysis , Gouy- Chapman and Stern model.

CO 4 :- Know the chemical dynamics , study of fast reaction and theory of unimolecular reactions.

CO 5 :- Study of corrosion and cyclic voltametry.

**Course Code- (MSC204) :- Theory and application of spectroscopy-II**

After successfully completing this course , students will be able to :-

CO 1 :- To learn about UV and visible spectroscopy.

CO 2 :- To learn Infrared spectroscopy through Instrumentation , Sample handling ,Characteristic vibration frequency.

CO 3:- To study mass spectrometry introduced to ion production & fragmentation & Interpretations.

CO 4 :- To learn & analysis nuclear resonance spectroscopy (NMR) – Theory Instrumentation, Chemical shift interpretation of NMR ( CMR spectra).

CO :- To learn structure elucidation based on spectroscopic data ( IR , UV , NMR and mass ).

**Course Code –( MSC205) :- Lab Course –I Chemistry**

After successfully completing its course , students will be able to :-

CO 1 :- To impart advances knowledge of general method of separation and purification of organic compound with solvent extraction . Fractional crystallization & Distillation techniques .

CO2 :- To learn analysis of organic binary mixture separation & identification .

CO 3 :- To understand preparation of organic compound single step preparations .

Course Code ( MSC-206) -: Social Outreach & Skill development field work (project)

CO 1 :- To learn and study of the project work of field work laboratory knowledge is to introduced research methodology in the subject prepare them for pursuing research in theoretical experimental or computation area of subject.

**M.SC. Chemistry Second semester**

**Course code-(M.SC-02) PRJ/SSC**

Social outreach and skill development field work .

**Outcome-**The aim of the project work or field work us to introduce students with the research methodology in the subject and to prepare them for perusing research theoretical experimental or computational areas of the subject.

**M.Sc. Third Semester (Old Syllabus)**

**Chemistry**

**Course Code-(MSC 301) :- Application of Spectroscopy - inorganic Chemistry**

After completing this course students will be able to –

CO 1 :- To learn about application of spectroscopy in various field of inorganic chemistry –AAS ,AES , PES ,Flame emission photoelectron and Raman Spectroscopy.

CO 2 :- To learn about vibration spectroscopy & Symmetry and shapes , mode of bonding , ethylene Diamine and Diketonato complex , Metalloproteins & application of Raman Spectroscopy.

CO 3 :- To study electro spin resonance spectroscopy by Hyperfine coupling & Inorganic free radicals.

CO 4 :- To understand the NMR of paramagnetic substance metal nuclides & specific study of MRI.

CO 5 :- To study Mossbauer spectroscopy –Basic principles & spectral parameters with applications.

**Course Code –(MSC 302) :- Application of Spectroscopy –Organic Chemistry**

After completing this course students will be able to –

CO 1 :- To understand basic concept & interpretation of UV visible spectroscopy , Carbonyl compound.

CO 2 :- To study mass Spectroscopy – Introduced , ion production, fragmentation ,ion analysis to determine the structure.

CO 3 :- To learn about infrared spectroscopy – Instrumentation sample handling and characteristic vibrational frequencies to study FITR of gaseous , solid and polymeric material and ORD & CD ,octant rule for ketones.

CO 4 :- To understand the NMR spectroscopy – Inroduction ,Mechanism , Stereochemistry and Applications.

CO 5 :- To study nuclear magnetic double resonance & Nuclear overhauser effect (NOE) . To understand 13 NMR Spectroscopy , two dimension NMR spectroscopy.

**Course Code – (MSC303) :- Photochemistry and pericyclic reactions**

After completing of this course students will be able to –

CO 1 :- To understand the basic of photochemistry law & Principles.

CO 2 :- To study photo-physical process in excited state & Exicted state of metal complexes.

CO 3 :- To learn about photochemistry of carbonyl compounds and alkenes.

CO 4:- To study photo-rearrangement and reactions of various rearrangement with mechanism & application or photochemistry .

CO 5 :- To Study pericyclic reaction with mechanism utilization of organic synthesis.

**Course Code – (MSC .C03) – Organic Synthesis-II**

After completion of this course students will be able to-

CO 1 :- To study disconnection approach , learn to synthesis disconnection one & two group C-X disconnection approach

CO 2:- To understand the protecting group – alcohol ,amine carbonyl , and one group C-C disconnections study of region selectivity & alkene synthesis.

CO 3 :- To understand two group C-C disconnection of carbonyl & 1,5 difunctionalised compound .

CO 4:-To study ring synthesis saturated hetero cycles & aromatic hetero cycles in organic synthesis.

CO 5 :- To understand & learn the synthesis of some complex molecules & application – Camphor , Cartisome , Reserpine , Vitamin & others compounds.

**Course Code – (MSC 311) :- Organic Chemistry Lab Course .**

After completing of this experimental lab course students will be able to :-

CO 1 :- To learn & gain practical knowledge of organic preparation , purification and chromatography .

CO 2 :- To understand purification technique TCC/CC & paper chromatography.

CO 3 :- To analysis extraction of natural products & to prepare some organic preparation two or more them steps.

CO 4 :- Qualitative analysis of binary mixture only two.

**M.Sc. Fourth Semester (CBCS)**

Course Code – (MSC401):- Bioinorganic chemistry

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

CO 1:- To learn about essential and trace metal ions , crown ethers , Na & K and toxicity in biochemical system.

CO 2 :- To understand the respiratory proteins introduce to heme iron proteins porphyrin system & model compound for oxygen carriers .

CO 3 :- To study metallo enzymes & metal ion transport and storage through many types of proteins Cu , Zn SoD & cytochrome P450.

CO 4 :- To learn Nitrogenase enzyme with nitrogen fixing ,metal cluster transition metal complexes , dinitrogen complexes

CO 5 :- To understand the medicinal bio-inorganic chemistry / chelation therapy.

**Course Code –(MSC 402) :- Environmental Chemistry**

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

CO 1 :-To study Atmospheric chemistry know the structure of the earth atmosphere globlal warming , green house effect , carbon & nitrogen cycle ,acid rain.

CO 2 :- To understand polluted air type of pollution ,monitoring ,Co / NO sources control of air pollution .

CO 3 :- To study water pollution by the chemistry of water pollution & know the water quality standard parameter & Oxygen demanding wastes.

CO 4 :- To understand and analysis of soil ,Determination of total nitrogen ammonia ,nitrogen , Na , Mg , Ca , K , & chemical toxicology.

CO 5 :- To understand the sources ,measurement of noise level , sound & Noise pollution , and know the industrial pollution due to many industries.

**Course Code – (MSC403):- Solid State Chemistry**

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

CO 1 :- To Study of solid states reactions ,preparation methods & X-ray study.

CO 2 :- To understand the powder compact reaction and solid state defects.

CO 3 :- To know the electronic properties and **Band Theory.**

CO 4 :- To study solid electrolytes.

CO 5 :- To understand the magnetic and optical properties of solids.

**Course Code –(MSC D02) :- Material Science**

After completion of this course student will be able to:-

CO 1 :- To study of classification of crystals and know the seven crystal system.

CO 2 :- To understand the crystal geometry & symmetry elements for solids.

CO 3 :- To learn theories of metallic state examples and applications.

CO 4 :- To understand the ionic conductors types with the examples & applications.

CO 5 :- To study organic semiconductors & Classification.

**Course Code – (MSC 411) :- Organic Chemistry Lab Course**

CO 1 :- To gain practical knowledge of instrumental experiments , estimation of organic and inorganic field.

CO 2 :- To analysis of organic compounds and inorganic compounds. Determination by spectro-photometric ,pH –metry , polarography , flame photometer & Refractometry .

CO 3 :- To learn through separation and qualitative estimation of Binary and ternary mixtures by the use of paper chromatography ,TLC , Ion exchange , Solvent extraction and eletrophoretic separations.

CO 4 :- To understand the estimation of carbohydrate ,amino acid , ascorbic acid , nitrogen and sulphur .

**Course Code – (MSC 504 ):- Dissertation**

CO 1 :- They will gain proficiency in logical deduction skills through written problems and laboratory work.

CO 2 :- They will identify problems and generate hypotheses, develop and implement experimental method to test their hypothesis and analyze and interpret the resulting data laboratory practice and safety.

CO 3 :- Describe and critically analyze the topic of their dissertation at advanced level.

CO 4 :- Produce critical revieas of the relevant literature & produce a critical summary of their review CO 5 :- Enhanced skills in chemical information , scientific writing editing and proof reading, oral presentation and discussion of scientific results self motivation in self guided learning.

**Course Outcome and Program Outcome**

**Department of Physics**

**Program Outcome:**

1. **Critical Thinking:** Take informed actions after identifying the assumptions that frame our thinking and actions, checking out the degree to which these assumptions are accurate and valid, and looking at our ideas and decisions (intellectual, organizational, and personal) from different perspectives.
2. **Problem Solving** :Understand and solve problems of relevance to society to meet the specified needs using the knowledge, skills and attitudes acquired from humanities / sciences/ mathematics/ social sciences.
3. **Computational Thinking** Understand data-based reasoning through translation of data into abstract concepts using computing technology-based tools.
4. **Effective Communication** :Speak, read, write and listen clearly in person and through electronic media in English and in one Indian language, and make meaning of the world by connecting people, ideas, books, media and technology.
5. **Environment and Sustainability** :Understand the issues of environmental contexts and sustainable development.

**Course Outcome:**

**B.Sc. 1st Year:**

Student should be able to …

* Get knowledge about the vectors and differential equations used in physics.
* Get an idea of different types of motion and conservation of laws.
* Get an idea about rotational motion, oscillatory motion and various properties of matter like elasticity and viscosity.
* Get an idea about Frame of reference and Special theory of Relativity.
* Greet knowledge about the vector analysis and able to apply in electrostatic and magneto static.
* Get idea about Electric fields, Force and Potentials.
* Get idea about Dielectric and Electric currents and also the application in AC circuits.
* Get idea about Magnetic properties of material.
* To get idea about Electromagnetic Induction and Maxwell’s equation and Electromagnetic wave propagation.
* Solve the numerical problems based on entire syllabus.

**B.Sc. 2nd Year:**

* Understand the relation between microscopic and macroscopic description through statistical mechanics; know and can apply the laws of thermodynamics and principles of free energy; describe thermodynamic processes and heat engines.
* Understand the efficiency of Carnot’s engine and the significance of first law and second of thermodynamics and implications of the second law of thermodynamics and limitations placed by the second law on the performance of thermodynamic systems.
* Ability to evaluate entropy changes in a wide range of processes and determine the reversibility or irreversibility of a process from such calculations.
* Understand the process of thermal conductivity, viscosity and diffusion in gases.
* Understand the interrelationship between thermodynamic functions and ability to use such relationships to solve practical problems.
* Understand basics of three-level and four-level lasers, Ruby, He-Ne and semiconductor laser.
* Understand the concepts of mechanics, acoustics and the properties of matter.
* Ability to recognize and use a mathematical oscillator equation and wave equation, and derive these equations for certain systems, point out the limitations and be able to refer to very different solutions of identical oscillator equations due to different initial and boundary conditions.
* Understand how several waves or parts of waves interact, and be able to calculate and analyze diffraction and interference phenomena, and explain the conditions required for such phenomena to appear.
* Able to calculate what happens when waves move from one medium to another, and be able to explain dispersion and group and phase velocity.
* Use Lissajous figures to understand simple harmonic vibrations of same frequency and different frequencies.
* Able to solve wave equation and understand significance of transverse wavesalongitudinal wave.
* Understand application of acoustics in noise and music, musical scale, sonar and ultrasonic.
* Understand phenomenon based on light and related theorieslike reflection, refraction, interference, diffraction, polarization.
* Get skills to identify and apply formulas of optics and wave physics
* Understand the applications of interference in design and working of interferometers.
* Understand the resolving power of different optical instruments.

**B.Sc. 3rd Year:**

* Understand the motion of objects in different frame of references.
* Develop understanding of special theory of relativity and its applications to understand length contraction, time dilation, relativistic addition of velocities, conservation of momentum and variation of mass, relativistic momentum, relativistic energy, and mass-energy relation.
* Understand the origins of quantum mechanics and explain the differences between classical and quantum mechanics.
* Understand the idea of wave function, the uncertainty relations, Schrödinger wave mechanics and operator formalism.
* Solve the Schrödinger equation for simple 1D time-independent potentials.
* Understand many electron atoms and interaction of spins i.e., LS and JJ coupling.
* Understand rotational, vibrational, electronic and Raman spectra of molecules and their applications.
* Understand basic concepts of semiconductor physics, diffusion length, relaxation time, band bending, Einstein’s relationship and Continuity Equation.
* Understand junction physics i.e., physics of metal –metal junctions, metal semiconductor junctions. PN junctions: spatial variation of electric fields, potential etc.,
* Understand of bipolar junction transistor: fabrication and operational regions.
* Understand of principle and working unipolar devices and hetero-junction MOSFETs.
* Understand basic concepts of semiconductor physics, BJT, operation of transistor and CE, CB and CC configurationand able to solve problems related to power amplifiers, transformers, coupled amplifiers, class A and B operation, power calculations and efficiency.
* Understand use of H-parameters, small signal analysis, Bode plots and frequency response.
* Understand logic families and their comparison and familiar about the principle of communication systems.

**Course outcome and Program outcome Department of Botany**

**Session 2022-23**

**Course Outcomes**

1. Understand the general characteristics and affinities of Bryophytes, Pteridophytes and Gymnosperms

2. Phylogenitic relationship with the help of Pala botanical studies

3. Learn morphology, and flower architecture of angiosperms

4. Develop skills for identify microbes and using them for industrial, agriculture and Environment pursues.

5. Practical skills in the field and laboratory experiments in microbiology & Pathology.

6. Learn to identify Algae, Lichens and plant pathogens along with their Symbiotic and parasitic association.

7. Learn microbial techniques which will be beneficial for agriculture and industry.

8. Apply their knowledge in the crop fields to eradicate or avoid the diseases.

9. Understand the plant taxonomy

**Program outcome**

1. Practical skills Students leant to carry out practical work. in the field and in the laboratory, with minimal risk. They gain introductory experience in applying each of the following skills and gain greater proficiency in a selection of them depending on their choke of optional modules.

2. Interpreting plant morphology and anatomy.

3. Plant identification.

4. Vegetation analysis techniques.

5. A range of physiochemical analyses of plant materials in the context of plant physiology and biochemistry.

6. Plant pathology to be added for sharing of field and lab data obtained.

7. Career planning. Scientific Knowledge: Apply the knowledge of basic science, life sciences and fundamental process of plants to study

**Course Outcome and Program Outcome Department of Mathematics**

**Program Outcome of Mathematics:-**

1. Students will become employable; they will be eligible for career opportunities in Industry, or will be able to opt for entrepreneurship.

2.Students will possess basic subject knowledge required for higher studies, professional and applied courses like Management Studies, Law etc.

3 Students will be aware of and able to develop solution oriented approach towards various Social and Environmental issues.

4.Student is equipped with mathematical modeling ability, problem solving skills, creative talent and power of communication necessary for various kinds of employments.

5 Student should be able to apply their skills and knowledge that is translate information presented verbally into mathematical form, select and use appropriate mathematical formulae or techniques in order to process the information and draw the relevant conclusion.

**Course outcome of Mathematics:-**

1.Apply the concept and principles of differential calculus to find the curvature, concavity and points of inflection, envelopes, rectilinear asymptotes (Cartesian & parametric form only) of different curves.

2.To learn Inner Product spaces and Gram-Schmidt process of orthogonalization.

3.Plot the graphs of polynomials of degree 4 and 5, the derivative graph, the second derivative graph and compare them.

4.Solve various limit problems using L’ Hospital’s rule·

5.Apply the integral calculus to find arc length of a curve, arc length of parametric curves, area under a curve, surface area and volume of surface of revolution.

6.Graphically obtain the surface of revolution of curves.

7.Transform the co-ordinate system especially by Rotation of axes, thus reducing different second-degree equations to their corresponding simplest forms and also classify the conics using the discriminant.

8.Understand the geometrical terminology and have a detailed clear-cut idea of the Planes, Straight lines in 3D, Spheres, Cylindrical surfaces, Central conicoids, Paraboloids, Plane sections of conicoids along with the Tangent and normals of the conicoids.

9.Find the Triple product of Products and their Applications

10.Find the limits and verify continuity of vector functions.

**BCA & PGDCA Program outcomes**

1. Its undergraduate and postgraduate program demonstrate and apply the fundamental knowledge of the basic principal in various field of computer science.
2. Students are eligible to pursue entry and apply for jobs in various multinational companies , industries , bank .
3. They can start their own business in web development and software development.
4. Students are able to use their knowledge to develop different web and windows based application.
5. Students can also become network administrator.
6. Students can create data base and application for their clients .
7. Understand and develop computer programs in the area related to algorithm web design networking for efficient design of computer based system.
8. After completion of undergraduate program will prove their in different competitive exam like(Technical Assistance, Administrative job) NTPC state PSC , UPSC ,IFC bank PO, railways and many other power plants/ Coal mins/ Lab technician and teacher.
9. After completion of post graduate program in computer science student can prepare for NET/SET of various research filed and also make their carrier through hyper studies Ph.D in computer science and apply for state level AP.PSC(Assistant professor , professor ,associate professor ) and make their carrier as a scientist.

**BCA 1st year course outcome**

**Subject (Digital Electronic)**

At the end of this course, the students will be able to:

1. Examine the structure of number systems and perform the conversion among different number systems.
2. Illustrate reduction of logical expressions using Boolean algebra, k-map and tabulation method and implement the functions using logic gates.
3. Realize combinational circuits for given application.
4. Analysis synchronous and asynchronous sequential circuits using flip-flops.
5. Define combinational logic circuits using programmable logic devices.

**Subject (Data Structure)**

At the end of this course, the students will be able to:

1. Use different types of data structures, operations and algorithms.
2. Implement appropriate sorting/searching technique for any given problem.
3. Use stack, Queue, lists, trees and graphs in problem solving.
4. Find suitable data structure during application development /problem solving.

**Subject (Computer fundamental and MS office)**

At the end of this course, the students will be able to:

1. Describe the history and types of computer and various input output devices.
2. Understand the concept of memory and its type.
3. Understand the M.S. word with page setup formatting text, print document and mail merge.
4. Understand the M.S. excel with creating sheets, calculation in cell and prepare charts.
5. Understand the sorting & filter in M.S. excel.
6. Understand the M.S. power point with design templates, slide transaction and animation effects.

**Subject (Programming with C and C++)**

At the end of this course, the students will be able to:

1. Develop programming skill and learn how to implement a new software.
2. Develop programming and logical concepts which helps to build up source code of concern programming language.
3. Understand the concept of programming like compilation, debugging, Executing, linking and loading.
4. Familiar about the structure of C and C++ program.
5. Understand about the cursor movement and control structure of C and C++ program.
6. Write simple C and C++ programs using programming concepts.
7. Familiar about procedure oriented and object oriented concepts.
8. Understand the concept of Inheritance and polymorphism which helps them to develop programs to solve real world problems.
9. Use file handling concepts in C and C++ to develop programs for real lie projects.
10. Develop new application with C and C++ which helps them to switch in software industry.

**Subject (Discrete Mathematics)**

At the end of this course, the students will be able to:

1. Learn about partially ordered sets, lattices and their types.
2. Understand Boolean algebra and Boolean functions, logic gates, switching circuits and their applications.
3. Solve real life problem using finite-state and turning machines.
4. Assimilate various graph theoretic concepts and familiarize with their appilications.

**BCA 2ND YAER**

COURSE OUTCOMES

Mathematics Paper 1:-Numerical analysis

1. To solve the bisection method , regular falsi method & Newton method ,solution of cubic biquadrate equation.

2. To understand the gauss – Jordan method , Cholesky’s method inversion of matrix power method transformation to diagonal forms.

3. To solve the Newton’s interpolation formula ,Newton’s forward and backward difference interpolation formula , Newton’s divided difference interpolation formula.

4. To solve numerical differentiation and integration ,trapezoidal rule, Simpson’s one –third and three eight rule, waddles rule.

5. To solve the numerical solution of first order ordinary differential equations one step method Euler’s Picard’s and taylor’s series methods.

**Paper – 2(Differentiation and Integration)**

1. To discuss the successive differentiation Lebnitz’s theorem Rolle’s Theorem, expansion by taylor’s and maclaurin’s series.

2. To solve test of convexity and concavity, point of Inflaxion , Cartesian and polar farm.

3. To solve partial and directional of functions of two and three variables Jacobian theorem.

4. To understand integration of functions by parts substitution and by partial fraction.

5.To solve integration of function of two and three variable change of order of integration.

**Paper 3 (Data Structure)**

1. Introduction of the basic terminology , elementary data organization , data structure operation.
2. Concepts of array , linear array , sorting , bubble sort , searching:-linear search , binary search pointer array and record structure.
3. To understand the traversing a linked list , searching a linked list , stack , queues , deletion of the linked list.
4. To solve the types of tree , binary trees , traversing binary tree, searching & inserting in binary tree.
5. To understand sorting , inserting sort , merging.

**Subject:-DBMS(Data base management system)**

1. To understand the use of structured query language and its syntax transaction data base recovery and techniques for query.
2. Acquire and global understanding for data base system concepts to be in a position to use and design data base for different application.
3. Gain a good understanding of the architecture and functionality of data base management system , system as well tools, techniques principal of data base modeling .

**Subject(Programming in C++)**

1. Understand fundamental construct **of OOPs.**
2. Get the knowledge of different form of OOPs implementation.
3. To demonstrate the differences between traditional imperative design and object oriented design.
4. To understand to roll of inheritance , polymorphism , dynamic binding and generic structure in building reusable code.

**Subject(Computer networking)**

1. Explain the rule of protocol in networking in to analysis the services and feature of the various layer in the protocol stack.
2. Understand design issues In network security and to understand security threads services and mechanics to counter.
3. Familiar with basic devices like repeaters bridges gateways and qualities of service .

**Subject(Linux programming)**

1. To know the basic concepts of Linux operating system.
2. Familiar with Linux command and system architecture.
3. To understand the various types or services .
4. To understand the shell programming GNOME & KDE and Text Processing.

**Subject (Principal or management)**

1.To provide fundamental knowledge and exposures theories and concepts in field of management.

2. To develop the knowledge of business and management principal.

3. To learns decision thinking and problem skills.

4. To teach sense of responsibility and a capacity for business management.

5.To explain the financial concepts used in making business decision.

**BCA 3rd year course outcomes**

**Subject-1.Calculus & Geometry**

1. To understand the existence of the Riemann Integral, properties of Riemann Integral .
2. To solve maximum and minimum function of two or three variables.
3. Finding Improper integral , meaning of integrals of type.
4. To solve equation to cone with give bas , Generators of cone, equation of a cylinder.
5. To solve the polar Coordinator , polar equation to straight line circle.
6. **Differential equations & Fourier Series**
7. To understand the concept of differential equation.
8. To solve the Geo-meteoric representation, Linear equation .
9. To understand the standard form of linear partial differential equation of higher order with constant coefficient.
10. To understand the periodic function of the Fourier sine and cosine series , Evan and Odd function.
11. **Computer System Architecture**
12. To make the students to learn the basic functions , principles and concepts of Computer Architecture.
13. To know on fundamental aspects of Computer Architecture and design.
14. To focus on processor design , control unit design techniques.
15. Understood Computer Architecture.
16. Understood processor design , control unit design.
17. **Programming in JAVA**
18. Understand the principles and practice of object oriented analysis and design in the construction of robust , maintainable programs which satisfy their requirements.
19. Implement ,compile, test and run java programs comprising more than one class , to address a particular software problem.
20. Understand the concepts of package , interface , multi-threading and file handling in java.

**5.Operating System**

1. Learn different types of operating system along with concepts of file system and CPU scheduling algorithms used in operating system .
2. Provide students knowledge of memory management and deadlock handling algorithms .
3. Implement various algorithm required for management , scheduling , allocation and communication used in operating system.

**6.Software engineering**

1. Select and implement different software developing process models.
2. Define the basic concepts and importance of software project management concepts like cost estimation , scheduling and reviewing the programs.
3. Apply different testing and debugging techniques and analyzing their effectiveness.
4. Extract and analyze software requirements specification for different project.

**7.Multimedia tools and application**

1. To learn multimedia need and areas of uses, multimedia elements-text, images, sounds , animation etc.

2.To study sound and its attributes, sound standards on PC, animation, images size on quality and storage.

3.To learn analog and digital video, various video standards NTSC,PAL,HDTV , introduction to video capturing media & instrument - video dish , DVCAM.

4.To study the multimedia authoring tools , key factory of selecting CD based multimedia authoring tools.

5.To study multimedia on the web , bandwidth relationship , text in the web , video on the web, real video , MPEG and SMIL , virtual reality.

**8.Finacial management & accountancy**

1.Financial Accounting -meaning and natural , accounting principal , profit and loss ,balance sheet.

2.Financial statement analysis -

Ratio analysis (liquidity ,solvency ,profitability ,efficiency , fixed and variable costs, sunk costs.)

3Cost-Volume profit(CVP) relationship , cash break-even point , graphic presentation of CVP relationship , limitation of break - even analysis.

1. Budgeting- Objective , preparation of various types of budgets including cash budget, fixed and flexible budgets.
2. Cost Accumulations system , simple treatment , absorption costing systems , comparison for income determination , variable costing as a tool of decision - making .

**PGDCA course outcomes**

1. **Introduction to software organization**
2. To introduces computer system characteristics , development of computer , types of computer, introduction to personnel computer , evaluation of PC’S input and output devices.
3. To understand the arithmetic logic unit ,control unit, storage devices, primary storage , **SIMM ,DIMM** types of storage devices.
4. To learn the basic needs of software , free domain software, booting process, function of OS , types of OS DOS , window , computer language program , data information , process oriented programming , object oriented programming.
5. To study the communication process , communication types, network , types of network , media -nic , NOS, bridge HOB WWW, E-mail , file transfer protocol.
6. To learn open source concept and evolution.

**2.Programming in ‘C’ and ‘C++’**

At the end of this course, the students will be able to:

1. Develop programming skill and learn how to implement a new software.
2. Develop programming and logical concepts which helps to build up source code of concern programming language.
3. Understand the concept of programming like compilation, debugging, Executing, linking and loading.
4. Familiar about the structure of C and C++ program.
5. Understand about the cursor movement and control structure of C and C++ program.
6. Write simple C and C++ programs using programming concepts.
7. Familiar about procedure oriented and object oriented concepts.
8. Understand the concept of Inheritance and polymorphism which helps them to develop programs to solve real world problems.
9. Use file handling concepts in C and C++ to develop programs for real lie projects.
10. Develop new application with C and C++ which helps them to switch in software industry.

**3.Database Management System**

1. To understand the use of structured query language and its syntax transaction data base recovery and techniques for query.
2. Acquire and global understanding for data base system concepts to be in a position to use and design data base for different application.
3. Gain a good understanding of the architecture and functionality of data base management system , system as well tools, techniques principal of data base modeling .

**4.Programming in JAVA**

1.Understand the principles and practice of object oriented analysis and design in the construction of robust , maintainable programs which satisfy their requirements.

2.Implement ,compile, test and run java programs comprising more than one class , to address a particular software problem.

3.Understand the concepts of package , interface , multi-threading and file handling in java.

**5.Programming in Visual Basic**

1.To understand the basic event driven program , terminology , working environment understanding , using code editor window , automatic completion features.

2. To create the program using object, properties, method , and events working with forms , interacting with the user :Input box function ,code statement.

3. To study the variables , declaring , scope , array , user-define data types, exiting loop ,working with date and time.

4.To understand logical operators , if..then statements , select case statements looping ,using DO..loop structure, For….Next statement ,exiting a loop.

5. Working with control ,status bars , toolbars, advanced standard.

6. Error trapping & debugging , break mode debug tool bar , watch window ,local window.

**6. Essentials of E-Commerce**

1.To prepare students to acquire the knowledge of recent trends in E-Commerce.

2. Students are prepared for website management which can helpful in industry.

3.To understand the nature and current trends of E-Commerce.

4.Understand the importance of advertising and marketing in the field of E-Commerce.

**GEOLOGY DEPARTMERT**

**COURSE AND PROGRAM OUTCOME**

**B.SC. 1ST YEAR FIRST PAPER PROGRAM OUTCOME**

**Unit 1:**

(i) Geology & its Perspectives:

Program Outcome: Students will gain a deep understanding of the fundamental principles of geology, its significance in the study of Earth, and its interdisciplinary applications in fields such as environmental science and resource management.

(ii) Origin of Earth:

Program Outcome: Students will comprehend the complex processes that led to the formation of the Earth and its early history, enabling them to appreciate the geological evolution of our planet.

(iii) Internal Structure of Earth, Crust, Mantle, and Core:

Program Outcome: Students will be able to describe the Earth's internal structure, explain the characteristics and interactions of its layers, and relate this knowledge to geological phenomena like earthquakes and volcanic activity.

(iv) Age of Earth: with special emphasis on Radioactive dating:

Program Outcome: Students will understand the techniques and evidence used to determine the Earth's age, with a focus on radioactive dating methods, which are crucial for establishing the timeline of geological events.

(v) Formation & Composition of Hydrosphere, Biosphere & Atmosphere:

Program Outcome: Students will gain insights into the interconnected systems of the hydrosphere, biosphere, and atmosphere, recognizing their roles in sustaining life and influencing global climate.

**Unit 2:**

(i) Elementary Idea about Plate Tectonics:

Program Outcome: Students will grasp the concept of plate tectonics, explaining how the movement of Earth's lithospheric plates shapes our planet's surface and leads to geological phenomena.

(ii) Concept & Theories of Continental Drift:

Program Outcome: Students will understand the historical development of the continental drift theory and its significance in the context of plate tectonics.

(iii) Concept & Theories of Isostasy:

Program Outcome: Students will appreciate the principle of isostasy and its role in maintaining equilibrium in the Earth's crust, leading to an understanding of landscape evolution.

(iv) Evidences of Sea-floor Spreading:

Program Outcome: Students will identify the geological evidence supporting sea-floor spreading, enabling them to connect this process to the creation of ocean basins.

(v) Origin of Oceans, Continents & Mountains:

Program Outcome: Students will comprehend how plate tectonics contributes to the formation of oceans, continents, and mountain ranges, linking theory to real-world geological features.

**Unit 3:**

(i) Earthquakes, Earthquake Belts, Measurement of Earthquakes:

Program Outcome: Students will be able to explain the causes of earthquakes, their distribution in earthquake belts, and the methods for measuring and assessing seismic activity.

(ii) Volcanoes: Types & Distribution:

Program Outcome: Students will classify different types of volcanoes and understand their global distribution, emphasizing the relationship between volcanic activity and plate tectonics.

(iii) Mid-Oceanic Ridges, Trenches & Island Arcs:

Program Outcome: Students will describe the origins, distribution, and geological importance of mid-oceanic ridges, trenches, and island arcs, deepening their understanding of plate tectonics.

(iv) Tectonics of Continental Margins:

Program Outcome: Students will differentiate between active and passive continental margins, recognizing their geological significance in terms of plate interactions.

(v) Neo-Tectonics: Active Faults, Drainage Changes:

Program Outcome: Students will analyze current geological activity, focusing on active faults and their influence on drainage patterns and landscape transformation.

**Unit 4:**

(i) Fundamental Concepts of Geomorphology:

Program Outcome: Students will develop a strong foundation in geomorphology, enabling them to interpret and explain landforms and the processes responsible for their creation.

(ii) Geomorphic Agents & Processes of Rock Weathering:

Program Outcome: Students will identify geomorphic agents, such as water, wind, and ice, and understand how they weather rocks, ultimately shaping the Earth's surface.

(iii) Geological Work of Rivers: Fluvial Landforms:

Program Outcome: Students will recognize the role of rivers in shaping landscapes, including the formation of fluvial landforms like valleys and meanders.

(iv) Geological Work of Wind: Aeolian Land Forms:

Program Outcome: Students will explain the effects of wind in creating aeolian landforms, such as sand dunes and loess deposits.

(v) Geological Work of Glaciers: Glacial Land Forms:

Program Outcome: Students will understand the geological processes associated with glaciers and their role in forming features like U-shaped valleys and moraines.

**Unit 5:**

(i) Geological Work of Oceans: Coastal Land Forms:

Program Outcome: Students will describe coastal landforms shaped by oceanic processes, including beaches, cliffs, and coastal caves.

(ii) Geological Work of Groundwater: Karst Topography:

Program Outcome: Students will explain how groundwater can create unique karst landscapes, including sinkholes, caves, and underground rivers.

(iii) Volcanic Land Forms:

Program Outcome: Students will identify volcanic landforms and understand their formation through volcanic eruptions.

(iv) Earth's Heat Budget & Global Climatic Changes:

Program Outcome: Students will analyze the Earth's heat budget and its influence on global climate, gaining insights into climate change dynamics.

(v) Physiographic Divisions of India:

Program Outcome: Students will classify and describe the physiographic regions of India, linking geological and geomorphic characteristics to India's diverse landscapes.

These program outcomes will help students develop a comprehensive understanding of geology and its relevance to Earth's dynamic processes and the environment.

**B.Sc 1st year second paper program outcome**

**Unit 1:**

(i) Definition of Mineral and Crystal:

Program Outcome: Students will be able to define minerals and crystals, distinguishing between these essential concepts in mineralogy.

(ii) Crystal Structures, Unit Cells:

Program Outcome: Students will understand crystal structures and the concept of unit cells, enabling them to identify and describe the arrangement of atoms in crystalline substances.

(iii) Elements of Crystal, Crystal Forms:

Program Outcome: Students will identify the elements of a crystal and the various crystal forms, developing the ability to recognize different crystal shapes.

(iv) Crystallographic Axes and Axial Angles:

Program Outcome: Students will comprehend crystallographic axes and axial angles, allowing them to analyze and describe crystallographic properties.

(v) Parameters and Indices of Crystal Notation:

Program Outcome: Students will learn how to use parameters and indices in crystal notation, facilitating communication about crystal structures.

**Unit 2:**

(i) Laws of Crystallography:

Program Outcome: Students will be familiar with the fundamental laws of crystallography, enabling them to apply these laws in the study of crystal structures.

(ii) Crystal Symmetry:

Program Outcome: Students will understand the concept of crystal symmetry, allowing them to identify and analyze symmetry elements within crystals.

(iii) Classification and Symmetry of Normal Classes of Seven Crystal Systems:

Program Outcome: Students will classify crystals based on the seven crystal systems and recognize the symmetry properties within these systems.

(iv) Forms of Normal Classes:

Program Outcome: Students will be able to identify and describe the different crystal forms within normal classes, enhancing their knowledge of crystallography.

(v) Twinning in Crystals:

Program Outcome: Students will understand crystal twinning, recognizing its occurrence and effects in crystalline materials.

**Unit 3:**

(i) Nature of Light: Reflection and Refraction of Light:

Program Outcome: Students will grasp the nature of light, including its behavior with reflection and refraction, and relate it to the study of minerals.

(ii) Refractive Index, Critical Angles, Total Internal Reflection, and Becke Effect:

Program Outcome: Students will learn about refractive index, critical angles, total internal reflection, and the Becke effect, enhancing their ability to assess and interpret the optical properties of minerals.

(iii) Double Refraction, Nicol Prism, its Construction and Working:

Program Outcome: Students will understand double refraction, the construction and operation of Nicol prisms, and their application in mineral identification.

(iv) Polarizing Microscope - Its Parts & Functions:

Program Outcome: Students will identify the components and functions of a polarizing microscope, enabling them to use it effectively for mineral examination.

(v) Optical Properties of Minerals:

Program Outcome: Students will recognize and describe the optical properties of minerals, providing a basis for mineral identification and characterization.

**Unit 4:**

(i) Silicate Structures:

Program Outcome: Students will understand the structures of silicate minerals, which are crucial in the context of Earth's crust and mantle composition.

(ii) Bonding in Minerals:

Program Outcome: Students will learn about the bonding types in minerals, enhancing their understanding of mineral properties and reactivity.

(iii) Isomorphism, Polymorphism, and Pseudomorphism:

Program Outcome: Students will identify and differentiate between isomorphism, polymorphism, and pseudomorphism in minerals, allowing them to interpret variations in mineral composition.

(iv) Solid Solution:

Program Outcome: Students will grasp the concept of solid solution in minerals, which is significant in understanding the variations in mineral composition.

(v) Physical Properties of Minerals:

Program Outcome: Students will recognize and describe the physical properties of minerals, which are essential for mineral identification and classification.

**Unit 5:**

(i) Study of Composition, Physical and Optical Properties of the Following Mineral Groups: Olivine, Garnet, and Mica Groups:

Program Outcome: Students will study the composition, physical characteristics, and optical properties of mineral groups like olivine, garnet, and mica, allowing them to identify and classify these minerals.

(ii) Pyroxenes:

Program Outcome: Students will analyze the composition, physical properties, and optical characteristics of pyroxene minerals, enabling them to identify and describe these minerals.

(iii) Amphiboles:

Program Outcome: Students will study the composition, physical properties, and optical features of amphibole minerals, facilitating their identification and classification.

(iv) Feldspars:

Program Outcome: Students will understand the composition, physical characteristics, and optical properties of feldspar minerals, enhancing their knowledge of these common rock-forming minerals.

(v) Silica:

Program Outcome: Students will learn about the composition, physical properties, and optical characteristics of silica minerals, which are essential components in various geological settings.

These program outcomes will equip students with the knowledge and skills necessary for the study of minerals, crystallography, and optical properties, essential in the field of geology.

**B.SC 2ND YEAR FIRST PAPER PROGRAM OUTCOMES**

**Unit 1:**

(i) Magma, Definition, Origin & Composition:

Program Outcome: Students will be able to define magma, explain its origin, and describe its composition, forming the foundation for understanding igneous processes.

(ii) Bowen's Reaction Series, Magmatic Differentiation & Assimilation:

Program Outcome: Students will understand Bowen's reaction series and its significance in igneous rock formation. They will also grasp the concepts of magmatic differentiation and assimilation, critical for the study of igneous rocks.

(iii) System, Phases & Component, Principles of Thermodynamics:

Program Outcome: Students will learn the concepts of systems, phases, components, and the principles of thermodynamics as applied to geological processes.

(iv) Texture, Structures & Classification of Igneous Rocks:

Program Outcome: Students will identify and classify the textures and structures of igneous rocks, facilitating the recognition and interpretation of different rock types.

(v) Forms of Igneous Rocks:

Program Outcome: Students will recognize and understand the various forms of igneous rocks, including intrusive and extrusive forms, enhancing their ability to categorize and analyze these rocks.

**Unit 2:**

(i) Rock Association in Time & Space, Concepts of Rock Kindreds:

Program Outcome: Students will grasp the concept of rock associations in temporal and spatial contexts and understand the idea of rock kindreds, which are crucial in geological investigations.

(ii) Petrographic Studies of Acid Igneous Rocks:

Program Outcome: Students will conduct petrographic studies on acid igneous rocks, allowing them to describe and interpret the mineral composition and textures of these rocks.

(iii) Petrographic Studies of Alkaline Igneous Rocks:

Program Outcome: Students will analyze alkaline igneous rocks through petrographic studies, enabling them to identify and classify these rocks based on their mineralogy.

(iv) Petrographic Studies of Basic Igneous Rock:

Program Outcome: Students will conduct petrographic studies on basic igneous rocks, facilitating the identification and characterization of these rock types.

(v) Petrographic Studies of Ultrabasic Igneous Rocks:

Program Outcome: Students will engage in petrographic studies of ultrabasic igneous rocks, enhancing their ability to describe and interpret the mineral composition and textures of these rocks.

**Unit 3:**

(i) Origin, Transportation & Deposition of Sediments:

Program Outcome: Students will understand the processes of sediment formation, transportation, and deposition, essential for sedimentary rock analysis.

(ii) Dynamics of Sedimentary Depositional Environment; Aeolian, Fluvial, Coastal, and Abyssal Environment:

Program Outcome: Students will comprehend the dynamics of various sedimentary depositional environments, such as aeolian, fluvial, coastal, and abyssal, and their influence on sedimentary rock characteristics.

(iii) Concepts of Sedimentary Facies:

Program Outcome: Students will learn about sedimentary facies, allowing them to recognize and interpret the spatial and temporal variations in sedimentary rock deposits.

(iv) Concepts of Diagenesis:

Program Outcome: Students will understand diagenesis, including the physical and chemical changes that occur after sediment deposition, influencing the characteristics of sedimentary rocks.

(v) Textures & Structures of Sedimentary Rocks:

Program Outcome: Students will identify and describe the textures and structures of sedimentary rocks, enabling them to classify and interpret these rocks effectively.

**Unit 4:**

(i) Classification of Sedimentary Rocks:

Program Outcome: Students will classify sedimentary rocks into categories based on their characteristics and origin.

(ii) Petrography of Sedimentary Rock; Rudaceous, Arenaceous, Calcareous Sedimentary Rocks:

Program Outcome: Students will conduct petrographic analyses of sedimentary rocks, focusing on rudaceous, arenaceous, and calcareous types, to describe their mineralogical composition and textures.

(iii) Metamorphism; Definition, Agents, Facies & Grade:

Program Outcome: Students will define metamorphism, identify its agents, and understand the concepts of facies and grade, which are fundamental to the study of metamorphic rocks.

(iv) Textures, Structures & Classification of Metamorphic Rocks:

Program Outcome: Students will recognize the textures and structures of metamorphic rocks, enhancing their ability to classify and interpret these rocks.

(v) Equilibrium & Non-Equilibrium Reactions in Metamorphism:

Program Outcome: Students will differentiate between equilibrium and non-equilibrium reactions in metamorphism, providing insights into the formation of metamorphic minerals.

**Unit 5:**

(i) Paragenetic Diagrams; Projective Analysis A.C.F & A.K.F. Diagrams:

Program Outcome: Students will be able to create and analyze paragenetic diagrams and understand the significance of A.C.F and A.K.F diagrams in petrology.

(ii) Progressive Metamorphism of Argillaceous Rocks:

Program Outcome: Students will study the progressive metamorphism of argillaceous rocks, gaining an understanding of the mineral changes and textures that occur during this process.

(iii) Progressive Dynamo-Thermal Metamorphism of Impure Limestone:

Program Outcome: Students will examine the progressive dynamo-thermal metamorphism of impure limestone, enabling them to identify mineral transformations and structural changes.

(iv) Progressive Dynamo-Thermal Metamorphism of Basic Igneous Rocks:

Program Outcome: Students will explore the progressive dynamo-thermal metamorphism of basic igneous rocks, recognizing the mineralogical and textural changes that occur during this process.

(v) Petrographic Provinces of India:

Program Outcome: Students will identify and describe the petrographic provinces of India, connecting geological features to regional geology and mineralogy.

These program outcomes will equip students with the knowledge and skills necessary to study, identify, and classify various rock types, understand geological processes, and interpret the history of Earth's crust and lithosphere.

**B.SC 2ND YEAR SECOND PAPER PROGRAM OUTCOMES**

**Unit 1:**

(i) Definition and Scope of Structural Geology. Study of Outcrops. Effects of Dip and Slope on Outcrops:

Program Outcome: Students will understand the scope and significance of structural geology. They will be able to analyze geological outcrops, taking into account the impact of dip and slope on their appearance and interpretation.

(ii) Identification of Bedding. Dip and Strike Measurement:

Program Outcome: Students will acquire the skills to identify bedding in rock layers and measure dip and strike, crucial for interpreting geological structures.

(iii) Clinometer and Brunton Compass:

Program Outcome: Students will be proficient in using a clinometer and Brunton compass for precise measurement of dip and strike in the field.

(iv) Recognition of Top and Bottom of Beds:

Program Outcome: Students will be capable of distinguishing the top and bottom of sedimentary beds, enabling them to interpret the geological history of rock sequences.

(v) Concept of Rock Deformation. Concept of Stress and Strain Ellipsoids:

Program Outcome: Students will grasp the fundamental concepts of rock deformation, stress, and strain ellipsoids, forming the basis for understanding the mechanics of structural geology.

**Unit 2:**

(i) Fold Morphology:

Program Outcome: Students will recognize and describe the morphology of folds, which are essential structural features in geology.

(ii) Geometric and Genetic Classification of Folds:

Program Outcome: Students will be able to classify folds based on their geometry and genetic origin, aiding in the interpretation of deformation processes.

(iii) Recognition of Folds in the Field and on Geological Maps:

Program Outcome: Students will develop the skills to identify folds in the field and interpret their presence on geological maps.

(iv) Effect of Folds on Outcrops:

Program Outcome: Students will understand how folds impact geological outcrops, which is crucial for geological analysis and interpretation.

(v) Elementary Idea of Mechanics of Folding:

Program Outcome: Students will gain a basic understanding of the mechanical principles underlying folding processes in rocks.

**Unit 3:**

(i) Fault Morphology. Slip and Separation:

Program Outcome: Students will recognize and describe the morphology of faults, including their slip and separation characteristics.

(ii) Geometric and Genetic Classification of Faults:

Program Outcome: Students will be able to classify faults based on their geometry and genetic origin, aiding in the interpretation of deformation processes.

(iii) Recognition of Faults in the Field and on Geological Maps:

Program Outcome: Students will develop the skills to identify faults in the field and interpret their presence on geological maps.

(iv) Effect of Faults on Outcrops:

Program Outcome: Students will understand how faults impact geological outcrops, which is crucial for geological analysis and interpretation.

(v) Elementary Idea of Mechanics of Faulting:

Program Outcome: Students will gain a basic understanding of the mechanical principles underlying faulting processes in rocks.

**Unit 4:**

(i) Joint Morphology; Geometric and Genetic Classification of Joints:

Program Outcome: Students will recognize and describe the morphology of joints and classify them based on their geometry and genetic origin.

(ii) Foliation; Terminology, Kinds, Origin, and Relation to Major Structures:

Program Outcome: Students will understand the concept of foliation in rocks, including its terminology, types, origin, and its relationship to major structural features.

(iii) Lineation: Terminology, Kind, Origin, and Relation to Major Structures:

Program Outcome: Students will learn about lineation in rocks, including its terminology, types, origin, and its relationship to major structural features.

(iv) Salt Domes:

Program Outcome: Students will recognize the unique geological structures known as salt domes and their geological significance.

(v) Plutons; Tectonics & Emplacement:

Program Outcome: Students will understand the formation and emplacement of plutons, linking their occurrence to tectonic processes.

**Unit 5:**

(i) Types and Recognition of Unconformity:

Program Outcome: Students will identify various types of unconformities in geological sequences, essential for interpreting geological histories.

(ii) Outlier and Inlier. Overlap & Offlap:

Program Outcome: Students will understand the concepts of outliers, inliers, overlap, and offlap in the context of geological stratigraphy.

(iii) Concept of Tectonics:

Program Outcome: Students will grasp the fundamental concept of tectonics, which underlies the movement and deformation of the Earth's crust.

(iv) Tectonic Framework of Peninsula, Indo-Gangetic Plains and Extra-Peninsular India:

Program Outcome: Students will recognize and describe the tectonic framework of different regions of India, linking geological structures to regional geology.

(v) Stereographic Projection & Its Use in Structural Geology:

Program Outcome: Students will be proficient in using stereographic projections for the analysis and representation of structural data, which is vital for structural geological investigations.

These program outcomes will equip students with the knowledge and skills necessary to understand and interpret geological structures, both in the field and on geological maps, enhancing their abilities in structural geology.

**B.SC 3RD YEAR FIRST PAPER PROGRAM OUTCOMES**

**Unit 1:**

(1) Palaeontology: Fossils - Definition, Essentials for Fossilization, Mode of Fossilization:

Program Outcome: Students will understand the concept of palaeontology, including the definition of fossils, the essential conditions for fossilization, and the various modes of fossilization.

(2) Uses of Fossils; Index Fossils & Their Significance:

Program Outcome: Students will learn the practical applications of fossils, including their use as index fossils to determine relative geologic ages and their significance in understanding past environments.

(3) Application of Palaeontology in the Study of Stratigraphy, Palaeoecology, and Palaeogeography:

Program Outcome: Students will appreciate how palaeontology plays a vital role in stratigraphic studies, reconstructing ancient ecosystems (palaeoecology), and deciphering the paleogeographic history of Earth.

(4) Micro Palaeontology& Their Significance:

Program Outcome: Students will be able to identify the significance of microfossils in geological and paleoenvironmental studies.

(5) Study of Plant Fossils & Their Significance:

Program Outcome: Students will gain an understanding of plant fossils and their importance in reconstructing past terrestrial ecosystems and climatic conditions.

**Unit 2:**

(1) Morphology & Geologic Distribution of Foraminifera & Anthozoa Fossils:

Program Outcome: Students will learn to recognize the morphology and understand the geologic distribution of foraminifera and anthozoa fossils.

(2) Morphology & Geological Distribution of Gastropoda and Lamellibranchia Fossils:

Program Outcome: Students will be able to describe the morphology and geological occurrence of gastropoda and lamellibranchia fossils.

(3) Morphology & Geological Distribution of Cephalopoda:

Program Outcome: Students will recognize the morphology and geologic distribution of cephalopod fossils.

(4) Morphology & Geological Distribution of Echinoidae& Brachiopoda Fossils:

Program Outcome: Students will understand the morphology and geological occurrence of echinoid and brachiopod fossils.

(5) Morphology & Geological Distribution of Trilobite and Graptolite Fossils:

Program Outcome: Students will identify the morphology and geological distribution of trilobite and graptolite fossils.

**Unit 3:**

(1) Principles of Stratigraphy: Geological Time Scale:

Program Outcome: Students will grasp the fundamental principles of stratigraphy and gain knowledge about the geological time scale.

(2) Basic Concept of Lithostratigraphic, Chronostratigraphic &Biostratigraphic Units:

Program Outcome: Students will understand the concepts of lithostratigraphic, chronostratigraphic, and biostratigraphic units and their significance in geological studies.

(3) Structural & Physical Subdivision of Indian Subcontinents:

Program Outcome: Students will be able to describe the structural and physical subdivision of the Indian subcontinent, linking it to its geological history.

(4) Distribution, Classification & Economic Importance of Archaeozoic Rocks of India (Dharwar):

Program Outcome: Students will recognize the distribution, classification, and economic significance of Archaeozoic rocks in the Dharwar region of India.

(5) Distribution, Stratigraphy & Economic Importance of Bastar &Raoghat Group of Rocks (Chhattisgarh):

Program Outcome: Students will learn about the distribution, stratigraphy, and economic importance of the Bastar and Raoghat group of rocks in Chhattisgarh.

**Unit 4:**

(1) Distribution, Stratigraphy & Economic Importance of Vindhya & Chhattisgarh Group of Rocks:

Program Outcome: Students will understand the distribution, stratigraphy, and economic significance of the Vindhya and Chhattisgarh group of rocks.

(2) Stratigraphy, Palaeoclimate, Geographical Distribution & Economic Aspects of Gondwana Rocks:

Program Outcome: Students will gain insights into the stratigraphy, paleoclimate, geographical distribution, and economic aspects of Gondwana rocks.

(3) Stratigraphy, Distribution & Age of Deccan Traps:

Program Outcome: Students will recognize the stratigraphy, distribution, and age of the Deccan Traps, a significant geological feature.

(4) Stratigraphy, Distribution & Fossil Contents of Bagh & Lameta Bed:

Program Outcome: Students will be able to describe the stratigraphy, distribution, and fossil content of the Bagh and Lameta Bed rock formations.

(5) Distribution, Stratigraphy &Palaeontology of Salt Range Group of Rocks:

Program Outcome: Students will understand the distribution, stratigraphy, and the importance of paleontology in the Salt Range Group of rocks.

**Unit 5:**

(1) Distribution, Stratigraphy & Economics of Palaeozoic Rocks of Spiti Valley:

Program Outcome: Students will recognize the distribution, stratigraphy, and economic aspects of Palaeozoic rocks in Spiti Valley.

(2) Stratigraphy, Distribution, Fossil Content of Cretaceous Rocks of Trichinapalli:

Program Outcome: Students will gain knowledge of the stratigraphy, distribution, and fossil content of Cretaceous rocks in Trichinapalli.

(3) Stratigraphy, Distribution, Fossil Content & Economics of Jurassic Rocks of Kutch-Region:

Program Outcome: Students will be able to describe the stratigraphy, distribution, fossil content, and economic importance of Jurassic rocks in the Kutch region.

(4) Distribution, Stratigraphy, Economic Importance of Tertiary Rocks of Assam-Region:

Program Outcome: Students will understand the distribution, stratigraphy, and economic significance of Tertiary rocks in the Assam region.

(5) Distribution, Stratigraphy &Palaeontological Importance of Siwalik Group of Rocks:

Program Outcome: Students will recognize the distribution, stratigraphy, and the palaeontological significance of the Siwalik Group of rocks.

These program outcomes will equip students with the knowledge and skills necessary for the study of fossils, stratigraphy, and the geological history of various regions, linking them to the economic and paleontological aspects of geology.

**B.SC 3RD YEAR SECOND PAPER PROGRAM OUTCOMES**

**Unit 1:**

(i) Economic Geology & Its Perspectives; Global Mineral Deposit & Resource. Distribution of Mineral Deposits in Time & Space:

Program Outcome: Students will understand the concept of economic geology, its global context, and the spatial and temporal distribution of mineral deposits.

(ii) Classification of Mineral Deposits. Geological Thermometers:

Program Outcome: Students will be able to classify mineral deposits and learn the principles of geological thermometry, which is essential for understanding the conditions under which minerals form.

(iii) Magmatic & Hydrothermal Processes of Mineral Formation:

Program Outcome: Students will gain knowledge about the magmatic and hydrothermal processes involved in mineral formation, essential for the study of ore genesis.

(iv) Weathering: Product & Residual Deposit. Oxidation & Sulfide Supergene Enrichment Processes:

Program Outcome: Students will understand the weathering processes that lead to the formation of residual deposits and the mechanisms behind oxidation and sulfide supergene enrichment.

(v) Sedimentary Processes of Mineral Formation. Placer Deposits:

Program Outcome: Students will learn about sedimentary processes leading to the formation of mineral deposits, with a focus on placer deposits.

**Unit 2:**

Geological, Geographical Distribution, Mode of Occurrence, Mineralogy & Economic Importance of the Following Metallic & Nonmetallic Deposits of India:

Program Outcome: Students will be able to describe the geological and geographical distribution, mode of occurrence, mineralogy, and economic significance of various metallic and non-metallic deposits in India, including iron, manganese, chromium, copper, lead, zinc, gold, aluminium, refractory and fertilizer minerals, as well as minerals used in cement and chemical industries.

**Unit 3:**

(i) Coal Deposit: Origin, Definition & Stratigraphy:

Program Outcome: Students will understand the origin and stratigraphy of coal deposits, including the various types of coal.

(ii) Fundamentals of Coal Petrography. Peat, Lignite, Bituminous & Anthracite Coal Deposits of Chhattisgarh:

Program Outcome: Students will gain knowledge of coal petrography and the characteristics of different coal types, including peat, lignite, bituminous, and anthracite. They will also study the coal deposits of Chhattisgarh.

(iii) Origin of Natural Hydrocarbon, Migration & Accumulation. Types of Oil Traps; Structural, Stratigraphic, and Composite. Offshore & Onshore Oil Deposits of India:

Program Outcome: Students will understand the origin of natural hydrocarbons, their migration, accumulation, and the types of oil traps, including structural, stratigraphic, and composite traps. They will also study offshore and onshore oil deposits in India.

(iv) Radioactive Mineral: Mineralogy, Geochemistry, Prospecting Techniques, Geological & Geographical Distribution of Atomic-Mineral:

Program Outcome: Students will learn about radioactive minerals, including their mineralogy, geochemistry, prospecting techniques, and the geological and geographical distribution of atomic minerals.

(vi) Principles of Mineral Economics. National Mineral Policy:

Program Outcome: Students will grasp the principles of mineral economics and understand the importance of the National Mineral Policy.

**Unit 4:**

(i) Engineering Geology & Its Importance, Engineering Properties of Rocks:

Program Outcome: Students will recognize the significance of engineering geology and learn about the engineering properties of rocks.

(ii) Geological Conditions for Establishing Large Dams and Tunnels:

Program Outcome: Students will understand the geological conditions necessary for the construction of large dams and tunnels.

(iii) Elementary Study of Aerial Photographs & Satellite Imageries. Application of Remote Sensing in Town Planning:

Program Outcome: Students will gain knowledge of the basic interpretation of aerial photographs and satellite images and understand how remote sensing can be applied in town planning.

(iv) Hydrologic Cycle. Mode of Occurrence of Groundwater, Quality of Groundwater:

Program Outcome: Students will learn about the hydrologic cycle, the occurrence of groundwater, and the quality of groundwater.

(v) Hydrologic Properties of Rocks. Classification of Aquifers. Groundwater Provinces of India:

Program Outcome: Students will understand the hydrologic properties of rocks, the classification of aquifers, and the groundwater provinces of India.

**Unit 5:**

(i) Introduction to Mineral Exploration, Surface & Subsurface Methods of Mineral Exploration:

Program Outcome: Students will be introduced to the concept of mineral exploration and the various surface and subsurface methods used for this purpose.

(ii) Prospection Methods; Drilling, Sampling & Assaying:

Program Outcome: Students will learn about prospection methods, including drilling, sampling, and assaying, which are crucial for identifying mineral resources.

(iii) Geophysical Prospecting Techniques: Gravity, Electrical & Magnetic Methods:

Program Outcome: Students will understand the geophysical prospecting techniques, including gravity, electrical, and magnetic methods, used in mineral exploration.

(iv) Aerial and Seismic Prospecting Methods:

Program Outcome: Students will learn about aerial and seismic prospecting methods employed in mineral exploration.

(v) Environmental Impacts of Over-Exploitation of Mineral Resources:

Program Outcome: Students will be aware of the environmental impacts associated with the over-exploitation of mineral resources and the need for sustainable resource management.

These program outcomes will equip students with the knowledge and skills necessary to understand economic geology, mineral deposits, their geological and geographical distribution, and various exploration and resource management techniques.

**B.SC 1ST YEAR COURSE OUTCOMES**

**Unit 1:**

(i) Geology & Its Perspectives. Earth in the Solar System; Size, Shape, Mass, & Density:

- Students will comprehend the significance of geology and gain an understanding of Earth's position in the solar system, including its size, shape, mass, and density.

(ii) Origin of Earth:

- Students will learn about the theories and processes that contributed to the origin of our planet.

(iii) Internal Structure of Earth, Crust, Mantle, and Core:

- Students will be able to describe the internal structure of Earth, including the composition and characteristics of the crust, mantle, and core.

(iv) Age of Earth: With Special Emphasis on Radioactive Dating:

- Students will understand the methods used to determine the age of the Earth, with a focus on radioactive dating techniques.

(v) Formation & Composition of Hydrosphere, Biosphere & Atmosphere:

- Students will gain knowledge about the formation and composition of Earth's hydrosphere, biosphere, and atmosphere.

**Unit 2:**

(i) Elementary Idea about Plate-Tectonics:

- Students will acquire a foundational understanding of the theory of plate tectonics and its role in shaping the Earth's surface.

(ii) Concept & Theories of Continental-Drift:

- Students will explore the concept of continental drift and the historical theories that contributed to our modern understanding of plate movement.

(iii) Concept & Theories of Isostasy:

- Students will comprehend the concept of isostasy and the theories related to the balance of Earth's crust.

(iv) Evidences of Sea-Floor Spreading:

- Students will recognize the geological evidence supporting sea-floor spreading as a fundamental process in plate tectonics.

(v) Origin of Oceans, Continents & Mountains:

- Students will learn about the formation and geological history of Earth's oceans, continents, and mountain ranges.

**Unit 3:**

(i) Earthquakes, Earthquake Belts, Measurement of Earthquakes:

- Students will understand the causes and distribution of earthquakes and the methods used to measure and study seismic activity.

(ii) Volcanoes: Types & Distribution:

- Students will be able to differentiate between types of volcanoes and recognize their global distribution.

(iii) Mid-Oceanic Ridges, Trenches & Island Arcs; Origin, Distribution & Importance:

- Students will gain insights into mid-oceanic ridges, oceanic trenches, and island arcs, understanding their geological origins and significance.

(iv) Tectonics of Continental Margins; Active Margins & Marginal Basins:

- Students will explore the tectonic processes at continental margins, including active margins and marginal basins.

(v) Neo-Tectonics; Active Faults, Drainage Changes:

- Students will study neo-tectonics, focusing on active faults and changes in drainage patterns caused by recent tectonic activity.

**Unit 4:**

(i) Fundamental Concepts of Geomorphology:

- Students will grasp the fundamental concepts of geomorphology, which deals with the study of landforms and their evolution.

(ii) Geomorphic Agents & Processes of Rock Weathering:

- Students will understand the agents and processes responsible for the weathering of rocks and the formation of various landforms.

(iii) Geological Work of Rivers; Fluvial Land Forms:

- Students will learn about the geological processes and landforms shaped by river systems.

(iv) Geological Work of Wind; Aeolian Land Forms:

- Students will recognize the geological impact of wind in the formation of aeolian landforms.

(v) Geological Work of Glaciers; Glacial Land Forms:

- Students will explore the geological features created by glaciers and the resulting glacial landforms.

**Unit 5:**

(i) Geological Work of Oceans; Coastal Land Forms:

- Students will gain an understanding of the geological processes that shape coastal landforms.

(ii) Geological Work of Groundwater. Karst Topography:

- Students will learn about the geological processes associated with groundwater and the formation of karst topography.

(iii) Volcanic Land Forms:

- Students will identify and describe volcanic landforms and understand their geological origin.

(iv) Earth's Heat Budget & Global Climatic Changes:

- Students will comprehend Earth's heat budget and its connection to global climatic changes.

(v) Physiographic Divisions of India:

- Students will recognize and describe the various physiographic divisions of India and their geological characteristics.

**2ND PAPER**

Unit 1:

(i) Definition of Mineral and Crystal:

- Students will be able to define minerals and crystals and understand their fundamental characteristics.

(ii) Crystal Structures, Unit Cells:

- Students will gain knowledge of crystal structures and the concept of unit cells, which are essential for understanding the atomic arrangement in minerals.

(iii) Elements of Crystal. Crystal Forms:

- Students will recognize the elements of crystals and understand crystal forms, which are important for mineral identification.

(iv) Crystallographic Axes and Axial Angles:

- Students will be able to describe crystallographic axes and axial angles, which are crucial in crystallography.

(v) Parameters and Indices of Crystal Notation:

- Students will learn how to use parameters and indices for crystal notation, allowing them to represent crystal structures accurately.

Unit 2:

(i) Laws of Crystallography:

- Students will understand the fundamental laws and principles of crystallography.

(ii) Crystal Symmetry:

- Students will be able to identify and describe different forms of crystal symmetry.

(iii) Classification and Symmetry of Normal Classes of Seven Crystal Systems:

- Students will gain knowledge about the classification and symmetry of normal classes within the seven crystal systems.

(iv) Forms of Normal Classes:

- Students will learn about the different forms of normal crystal classes and their characteristics.

(v) Twinning in Crystals:

- Students will understand the concept of twinning in crystals and how it affects mineral properties.

Unit 3:

(i) Nature of Light: Reflection and Refraction of Light:

- Students will comprehend the nature of light and the principles of reflection and refraction as applied to minerals.

(ii) Refractive Index. Critical Angles. Total Internal Reflection and Becke Effect:

- Students will learn about refractive indices, critical angles, total internal reflection, and the Becke effect in the context of mineral optics.

(iii) Double Refraction. Nicol Prism: Construction and Working:

- Students will understand double refraction and how Nicol prisms are constructed and used in mineralogy.

(iv) Polarizing Microscope: Its Parts & Functions:

- Students will become familiar with the polarizing microscope, its components, and their functions in mineral analysis.

(v) Optical Properties of Minerals:

- Students will recognize and describe the optical properties of minerals, which are crucial for mineral identification.

Unit 4:

(i) Silicate Structures:

- Students will gain an understanding of the structures of silicate minerals, one of the most common mineral groups.

(ii) Bonding in Minerals:

- Students will learn about the types of chemical bonding found in minerals and their implications for mineral properties.

(iii) Isomorphism. Polymorphism and Pseudomorphism:

- Students will comprehend isomorphism, polymorphism, and pseudomorphism as they relate to mineral diversity.

(iv) Solid Solution:

- Students will understand the concept of solid solution in minerals and its impact on mineral composition.

(v) Physical Properties of Minerals:

- Students will be able to describe the physical properties of minerals, such as hardness, cleavage, and specific gravity.

Unit 5:

Study of Composition, Physical and Optical Properties of the Following Mineral Groups:

(i) Olivine, Garnet and Mica Groups:

- Students will study the composition, physical characteristics, and optical properties of minerals in the Olivine, Garnet, and Mica groups.

(ii) Pyroxenes:

- Students will learn about the composition, physical traits, and optical properties of pyroxene minerals.

(iii) Amphiboles:

- Students will recognize the composition, physical properties, and optical characteristics of amphibole minerals.

(iv) Feldspars:

- Students will understand the composition, physical attributes, and optical properties of feldspar minerals.

(v) Silica:

- Students will explore the composition, physical properties, and optical features of silica minerals.

These course outcomes will provide students with a comprehensive understanding of mineralogy, crystallography, optical properties of minerals, and the characteristics of various mineral groups.

**B.SC 2ND YEAR COURSE OUTCOME**

Unit 1:

(i) Magma, Definition, Origin & Composition:

- Students will be able to define magma and understand its origin and composition, including the types of elements and compounds present.

(ii) Bowen’s Reaction Series, Magmatic Differentiation & Assimilation:

- Students will grasp the concept of Bowen's reaction series and its significance in understanding magmatic differentiation and assimilation processes.

(iii) System, Phases & Components, Principles of Thermodynamics:

- Students will learn about geological systems, phases, and components, as well as the application of thermodynamic principles in geology.

(iv) Bi-Component Magma: Albite-Anorthite and Diopside-Anorthite:

- Students will study the characteristics and behavior of bi-component magmas, specifically Albite-Anorthite and Diopside-Anorthite systems.

(v) Texture, Structures & Classification of Igneous Rocks:

- Students will understand the various textures, structures, and classification criteria used for igneous rocks.

(vi) Forms of Igneous Rocks:

- Students will recognize the different forms and shapes of igneous rocks and understand their significance.

Unit 2:

(i) Rock Association in Time & Space, Concepts of Rock Kindreds:

- Students will learn about the temporal and spatial associations of rocks and the concept of rock kindreds in geological contexts.

(ii) Petrographic Studies of Acid Igneous Rocks:

- Students will conduct petrographic studies of acid igneous rocks, including their mineral composition and textures.

(iii) Petrographic Studies of Alkaline Igneous Rocks:

- Students will conduct petrographic studies of alkaline igneous rocks, examining their mineralogy and textures.

(iv) Petrographic Studies of Basic Igneous Rocks:

- Students will perform petrographic studies on basic igneous rocks, focusing on their mineral composition and textures.

(v) Petrographic Studies of Ultrabasic Igneous Rocks:

- Students will conduct petrographic studies on ultrabasic igneous rocks, examining their mineral characteristics and textures.

Unit 3:

(i) Origin, Transportation & Deposition of Sediments:

- Students will gain an understanding of the processes involved in the origin, transportation, and deposition of sediments.

(ii) Dynamics of Sedimentary Depositional Environments; Aeolian, Fluvial, Coastal, and Abyssal Environment:

- Students will learn about the dynamics of various sedimentary depositional environments, including aeolian, fluvial, coastal, and abyssal settings.

(iii) Concepts of Sedimentary Facies:

- Students will understand the concept of sedimentary facies and its role in interpreting sedimentary environments.

(iv) Concepts of Diagenesis:

- Students will recognize the processes and changes that occur during diagenesis, which transforms sediments into sedimentary rocks.

(v) Textures & Structures of Sedimentary Rocks:

- Students will be able to identify and describe the textures and structures commonly found in sedimentary rocks.

Unit 4:

(i) Classification of Sedimentary Rocks:

- Students will learn how to classify sedimentary rocks based on their characteristics and origins.

(ii) Petrography of Sedimentary Rock; Rudaceous, Arenaceous, Calcareous Sedimentary Rocks:

- Students will conduct petrographic studies of sedimentary rocks, with a focus on rudaceous, arenaceous, and calcareous types.

(iii) Metamorphism; Definition, Agents, Facies & Grade:

- Students will gain a comprehensive understanding of metamorphism, including its definition, agents, facies, and grade.

(iv) Textures, Structures & Classification of Metamorphic Rocks:

- Students will recognize the textures, structures, and classification criteria used for metamorphic rocks.

(v) Equilibrium & Non-Equilibrium Reactions in Metamorphism:

- Students will understand the concept of equilibrium and non-equilibrium reactions in the context of metamorphism.

Unit 5:

(i) Paragenetic Diagrams; Projective Analysis A.C.F & A.K.F. Diagrams:

- Students will learn how to interpret paragenetic diagrams and apply projective analysis using A.C.F and A.K.F. diagrams.

(ii) Progressive Metamorphism of Argillaceous Rocks:

- Students will study the progressive metamorphism of argillaceous rocks and recognize the changes that occur during this process.

(iii) Progressive Dynamo-Thermal Metamorphism of Impure Limestone:

- Students will understand the progressive dynamo-thermal metamorphism of impure limestone and its geological implications.

(iv) Progressive Dynamo-Thermal Metamorphism of Basic Igneous Rocks:

- Students will explore the progressive dynamo-thermal metamorphism of basic igneous rocks and its geological significance.

(v) Petrographic Provinces of India:

- Students will identify and describe the petrographic provinces of India, recognizing their geological characteristics and significance.

These course outcomes will provide students with

**2ND PAPER**

Unit 1:

(i) Definition and Scope of Structural Geology; Study of Outcrops; Effects of Dip and Slope on Outcrops:

- Students will gain an understanding of structural geology and its scope. They will learn to study geological outcrops and comprehend the effects of dip and slope on these outcrops.

(ii) Identification of Bedding; Dip and Strike Measurement:

- Students will learn to identify bedding in rock formations and measure dip and strike angles accurately.

(iii) Clinometer and Brunton Compass:

- Students will become proficient in the use of tools like the clinometer and Brunton compass for field measurements.

(iv) Recognition of Top and Bottom of Beds:

- Students will be able to recognize the stratigraphic order of beds, including distinguishing the top and bottom of rock layers.

(v) Concept of Rock Deformation; Concept of Stress and Strain Ellipsoids:

- Students will grasp the fundamental concepts of rock deformation and understand stress and strain ellipsoids.

Unit 2:

(i) Fold Morphology:

- Students will learn about the morphology and characteristics of geological folds.

(ii) Geometric and Genetic Classification of Folds:

- Students will classify folds based on their geometric and genetic attributes.

(iii) Recognition of Folds in the Field and on Geological Maps:

- Students will develop the skills to identify and understand folds in both field and map settings.

(iv) Effect of Folds on Outcrops:

- Students will comprehend how folds affect the appearance of geological outcrops.

(v) Elementary Idea of Mechanics of Folding:

- Students will gain a basic understanding of the mechanics underlying the formation of geological folds.

Unit 3:

(i) Fault Morphology; Slip and Separation:

- Students will study the morphology of geological faults, including concepts of slip and separation.

(ii) Geometric and Genetic Classification of Faults:

- Students will classify faults based on their geometric characteristics and genetic origins.

(iii) Recognition of Faults in the Field and on Geological Maps:

- Students will acquire the ability to identify faults in the field and on geological maps.

(iv) Effect of Faults on Outcrops:

- Students will understand how geological faults influence the appearance of rock outcrops.

(vi) Elementary Idea of Mechanics of Faulting:

- Students will gain a basic understanding of the mechanics underlying the formation of geological faults.

Unit 4:

(i) Joint Morphology; Geometric and Genetic Classification of Joints:

- Students will explore the morphology and classification of geological joints.

(ii) Foliation; Terminology, Kinds, Origin, and Relation to Major Structures:

- Students will learn about foliation in rock structures, its terminology, various types, origins, and its relation to major geological structures.

(iii) Lineation: Terminology, Kind, Origin, and Relation to Major Structures:

- Students will understand lineation, including its terminology, kinds, origins, and how it relates to major geological structures.

(iv) Salt Domes:

- Students will gain knowledge of salt domes in geological contexts.

(vii) Plutons; Tectonics & Emplacement:

- Students will study plutons, their tectonics, and emplacement processes in geological formations.

Unit 5:

(i) Types and Recognition of Unconformity:

- Students will be able to identify different types of unconformities in geological settings.

(ii) Outlier and Inlier; Overlap & Offlap:

- Students will learn the concepts of outliers, inliers, and the principles of overlap and offlap in geological contexts.

(iii) Concept of Tectonics:

- Students will understand the fundamental principles and concepts of tectonics in the Earth's crust.

(iv) Tectonic Framework of Peninsula, Indo-Gangetic Plains, and Extra-Peninsular India:

- Students will gain insights into the tectonic framework and geological structures of the Indian subcontinent.

(v) Stereographic Projection & Its Use in Structural Geology:

- Students will learn the principles of stereographic projection and its application in structural geology.

**B.SC 3RD YEAR COURSE OUTCOME**

Unit 1:

(1) Palaeontology: Fossils - Definition, Essentials for Fossilization, Mode of Fossilization:

- Students will understand the concept of palaeontology, learn the definition of fossils, and grasp the essentials and modes of fossilization.

(2) Uses of Fossils; Index Fossils & Their Significance:

- Students will explore the diverse uses of fossils in geological studies, including the significance of index fossils.

(3) Application of Palaeontology in the Study of Stratigraphy, Palaeoecology, and Palaeogeography:

- Students will understand how palaeontology plays a crucial role in stratigraphic analysis and the study of past ecosystems and geographies.

(4) Micro Palaeontology& Their Significance:

- Students will learn about microfossils and their significance in geological and paleontological studies.

(5) Study of Plant Fossils & Their Significance:

- Students will be able to study plant fossils and understand their importance in reconstructing Earth's history.

Unit 2:

(1) Morphology & Geologic Distribution of Foraminifera & Anthozoa Fossils:

- Students will learn the morphology of foraminifera and anthozoa fossils and their distribution in geological settings.

(2) Morphology & Geological Distribution of Gastropoda and Lamellibranchia Fossils:

- Students will study the morphology and geographical distribution of gastropoda and lamellibranchia fossils.

(3) Morphology & Geological Distribution of Cephalopoda:

- Students will explore the morphology and distribution of cephalopod fossils.

(4) Morphology & Geological Distribution of Echinoidae& Brachiopoda Fossils:

- Students will understand the morphology and distribution of echinoid and brachiopod fossils.

(5) Morphology & Geological Distribution of Trilobite and Graptolite Fossils:

- Students will study the morphology and distribution of trilobite and graptolite fossils.

Unit 3:

(1) Principles of Stratigraphy: Geological Time Scale:

- Students will gain knowledge of the fundamental principles of stratigraphy, including the geological time scale.

(2) Basic Concept of Lithostratigraphic, Chronostratigraphic &Biostratigraphic Units:

- Students will understand the concepts of lithostratigraphy, chronostratigraphy, and biostratigraphy for geological analysis.

(3) Structural & Physical Subdivision of Indian Subcontinents:

- Students will become familiar with the structural and physical subdivisions of the Indian subcontinent.

(4) Distribution, Classification & Economic Importance of Archaeozoic Rocks of India (Dharwar):

- Students will explore the distribution, classification, and economic significance of Archaeozoic rocks in India, specifically the Dharwar region.

(5) Distribution, Stratigraphy & Economic Importance of Bastar &Raoghat Group of Rocks (Chhattisgarh):

- Students will study the distribution, stratigraphy, and economic significance of the Bastar and Raoghat group of rocks in Chhattisgarh.

Unit 4:

(1) Distribution, Stratigraphy & Economic Importance of Vindhya & Chhattisgarh Group of Rocks:

- Students will examine the distribution, stratigraphy, and economic importance of the Vindhya and Chhattisgarh group of rocks.

(2) Stratigraphy, Palaeoclimate, Geographical Distribution & Economic Aspects of Gondwana Rocks:

- Students will learn about the stratigraphy, paleoclimate, geographical distribution, and economic aspects of Gondwana rocks.

(3) Stratigraphy, Distribution & Age of Deccan Traps:

- Students will gain insights into the stratigraphy, distribution, and age of the Deccan Traps.

(4) Stratigraphy, Distribution & Fossil Contents of Bagh & Lameta Bed:

- Students will explore the stratigraphy, distribution, and fossil contents of Bagh and Lameta Bed.

(5) Distribution, Stratigraphy &Palaeontology of Salt Range Group of Rocks:

- Students will study the distribution, stratigraphy, and paleontology of the Salt Range group of rocks.

Unit 5:

(1) Distribution, Stratigraphy & Economics of Palaeozoic Rocks of Spiti Valley:

- Students will learn about the distribution, stratigraphy, and economic aspects of Palaeozoic rocks in the Spiti Valley.

(2) Stratigraphy, Distribution, Fossil Content of Cretaceous Rocks of Trichinapalli:

- Students will examine the stratigraphy, distribution, and fossil content of Cretaceous rocks in Trichinapalli.

(3) Stratigraphy, Distribution, Fossil Content & Economics of Jurassic Rocks of Kutch-Region:

- Students will explore the stratigraphy, distribution, fossil content, and economic aspects of Jurassic rocks in the Kutch region.

(4) Distribution, Stratigraphy, Economic Importance of Tertiary Rocks of Assam Region:

- Students will study the distribution, stratigraphy, and economic importance of Tertiary rocks in the Assam region.

(5) Distribution, Stratigraphy & Paleontological Importance of Siwalik Group of Rocks:

- Students will understand the distribution, stratigraphy, and paleontological significance of the Siwalik group of rocks.

These course outcomes provide a comprehensive understanding of paleontology, stratigraphy, and geological features in various regions of India.

**2ND PAPER**

Unit 1:

(1) Economic Geology & Its Perspectives; Global Mineral Deposit & Resource Distribution:

- Students will gain an understanding of economic geology and its global perspective, including the distribution of mineral deposits in time and space.

(2) Classification of Mineral Deposits; Geological Thermometers:

- Students will learn about the classification of mineral deposits and the use of geological thermometers in mineral exploration.

(3) Magmatic & Hydrothermal Processes of Mineral Formation:

- Students will understand the processes of mineral formation related to magmatic and hydrothermal activity.

(4) Weathering: Products & Residual Deposits; Oxidation & Supergene Enrichment Processes:

- Students will explore weathering processes and the formation of residual deposits, including the mechanisms of oxidation and supergene enrichment.

(5) Sedimentary Processes of Mineral Formation; Placer Deposits:

- Students will learn about sedimentary processes leading to the formation of placer deposits.

Unit 2:

- Students will study the geological and geographical distribution, mode of occurrence, mineralogy, and economic importance of various metallic and non-metallic deposits in India, including iron, manganese, chromium, copper, lead, zinc, gold, aluminum, refractory minerals, and minerals used in cement and chemical industries.

Unit 3:

- Students will gain knowledge about coal deposits, their origin, definition, and stratigraphy. They will also learn about coal petrography and the various types of coal deposits, including peat, lignite, bituminous, and anthracite. The focus is on coal deposits in Chhattisgarh.

- Students will understand the origin, migration, and accumulation of natural hydrocarbons, as well as the different types of oil traps, including structural, stratigraphic, and composite traps. They will also learn about offshore and onshore oil deposits in India.

- Students will study radioactive minerals, including mineralogy, geochemistry, and prospecting techniques. They will explore the geological and geographical distribution of atomic minerals.

- Students will become familiar with the principles of mineral economics and the National Mineral Policy.

Unit 4:

- Students will understand the significance of engineering geology and its importance in assessing the engineering properties of rocks.

- Students will learn about the geological conditions required for the establishment of large dams and tunnels.

- Students will be introduced to the basics of aerial photographs and satellite imageries and their applications in town planning.

- Students will explore the hydrologic cycle, the mode of occurrence of groundwater, and the quality of groundwater.

- Students will understand the hydrologic properties of rocks, the classification of aquifers, and the groundwater provinces of India.

Unit 5:

- Students will gain an introduction to mineral exploration, including surface and subsurface methods for mineral exploration.

- Students will learn about prospecting methods, including drilling, sampling, and assaying.

- Students will be introduced to geophysical prospecting techniques, such as gravity, electrical, and magnetic methods.

- Students will study aerial and seismic prospecting methods used in mineral exploration.

- Students will explore the environmental impacts of over-exploitation of mineral resources.

These course outcomes provide students with comprehensive knowledge of economic geology, mineral resources, mineral exploration, geological properties of rocks, groundwater, and their applications in various fields of geology.

**Department of Zoology**

**Course Outcome (According to NEP 2020)**

**B.SC. 1st Year**

**Paper :- Animal Diversity: Non-Chordate and Chordate, Comparative Anatomy and Physiology of Non- Chordates.**

**CLO:- Upon completion of the course students should be able to :**

* Learn about the importance of systemic , taxonomy and phylogeny to get a concrete idea of evolution of non-chordate phyla.
* Understand the various morphological , anatomical structure and functions of animals of different phyla.
* Get the knowledge about economic , ecological and medical significance of various animals in human welfare.
* Understand the important parasites and their control measures.
* Comparison of the anatomy and physiology of the different taxa of non-chordates.

**Paper:- Cell Biology , Histology and Comparative Anatomy & Physiology of Chordates .**

**CLO:-At the end of this course , a students will be able:**

* Understand the basic structure , functioning of the cell and cell organelles and understand the intricate cellular mechanisms involved .
* Understand the tissues , how tissues are produced from cells in a normal course and about any malfunctioning which may lead to benign or malignant tumor.
* Develop an understanding of the evolution of vertebrates thus integrating structure , function and development .
* Understand the morphological , anatomical and physiological adaption in diverse habitats.
* Develop an understanding of the evolution of vertebrates thus integrating structure , function and development .

**B.SC. 2nd Year**

**Paper:- Genetics , Developmental Biology & Evolution**

**CLO:- After successfully completing this course , the students will be able to :**

* Apply the principles of Mendelian inheritance on interaction of genes.
* Various methods of sex determination in animal kingdom.
* Understand the cause and effect of alterations in chromosome number and structure .
* Know the Recent Assisted Reproductive Techniques.
* Develop critical understanding how a single-called fertilized egg becomes an embryo and then a fully formed adult by going through three importance processes of cell division , cell differentiation and morphogenesis .
* Understand the general patterns and sequential developmental stages during embryogenesis and understand how the developmental processes lead to establishment of body plan of multicellular organisms .
* Understand evolution through natural selection and other forces.

**Paper:- Biochemistry and Molecular Biology**

**CLO:- At the end of this course , the students will be able**

* Understand the structure and biological significance of carbohydrates , amino acids , proteins , lipids and nucleic acids.
* Understand the concept of enzyme , its mechanism of action and regulation .
* Learn the preparation of models of peptides and nucleotides.
* Learn biochemical tests for amino acids, carbohydrates , proteins and nucleic acids.
* Develop an understanding of concepts , mechanisms and evolutionary significance and relevance of molecular biology in the current scenario .
* Understand the process of DNA replication , transcription and translation.

**B.SC. 3rd Year**

**Paper :-Animal Behaviour , Chronobiology and Ecology**

**CLO:- After successfully completing this course , the students will be able to:-**

* Learn a wide range of theoretical and practical techniques used to study animal behavior.
* Develop skills , concepts and experience to understand all aspects of animal behavior .
* Objectively understand and evaluate information about animal behavior and ecology encountered in our daily lives.
* Understand and be able to objectively evaluate the role of behavior in the protection and conservation of animals in the wild.
* Consider and evaluate behavior of all animals , including the urban environment .
* know the evolutionary and functional basis of animal ecology.
* Understand what makes the scientific study of animal ecology a crucial and exciting Endeavour.
* Analyze a biological problem , derive testable hypotheses and then design experiments and put the tests into practice.
* Solve the environmental problem involving interaction of humans and natural systems at local or global level.

**Paper:- Microbiology , Parasitology , Immunology and Applied Zoology**

**CLO:- After completing this course , the students will be able to :-**

* Understand causative agents , pathogenesis , diagnosis , prophylaxis , and chemotherapy for various bacterial , viral , protozoan , and helminthic diseases .
* Understand the concept of immune mechanisms , their pathways , acquired immunity , hypersensitivity , and autoimmune disorders.
* Understand the aquaculture techniques , their problems and commercial viability .
* Understand the techniques and commercial significance of apiculture , sericulture , and lac culture.
* Understand the basic and technical skills related to dairy management , poultry and vermin composting .

**Practical B.SC. 1st Year**

**CLO:- After completion of practical work the outcome will be :**

* Able to know animal diversity in the form of museum / side for invertebrate and invertebrates .
* Capable to enumerate biology of invertebrates .
* Capable to explore anatomy of animas .
* Able to understand cytological , histological and osteological configuration for animal life.
* Capable to explain hematology of animal system .

**Practical B.SC. 2nd Year**

**CLO:- After completion of practical work the outcome will be :-**

* Able to understand and explain Mendel's Law of Inheritance .
* Capable to analyze inheritance of gene by pedigree analysis .
* Able to know laboratory culture of Drosophila .
* Able to understand cytological , histological and osteological configuration for animal life.
* Capable to understand Human keryotype and numerical alteration in chromosomes.
* Capable to explain Evolution and evidences.
* Capable of performing tests for identification of biological macromolecules .
* Able to estimate nucleic acids and Isolation of DNA .

**Practical B.SC. 3rd Year**

**CLO:- At the end of Course Students will be able to –**

* Learn a wide range of practical techniques used to study animal behavior .
* Develop skills, concepts and experience to understand all aspects of animal behavior .
* Objectively understand and evaluate information about animal behavior and ecology encountered in our daily lives.
* Understand and be able to objectively evaluate the role of behavior in the protection and conservation of animals in the wild.
* Consider and evaluate behavior of all animals, including humans, in the complex ecological world, including the urban environment.
* Understand causative agents, pathogenesis, diagnosis, prophylaxis, and chemotherapy for various bacterial, viral, protozoan, and helminthic diseases.
* Understand the concepts of immune mechanisms their pathways acquired immunity hypersensitivity and autoimmune disorders.
* Understand the aquaculture techniques their problems and commercial viability.
* Understand the techniques and commercial significance of apiculture, sericulture and lac culture.
* Understand the basic and technical skills related to dairy management, poultry and vermi-composting.

**Department of Economics**

**Program outcomes and course outcomes**

By completion of the program the students will able to understand the basic concepts fundamental principal related to economics and their relevance in the day to day life. Economics is the study of how societies, government, households and individuals allocation their scare resources.

The studies of economics can also provide valuable knowledge for making decision in everyday life and use of resources.

**B.A. First Year**

**Paper First: Principals of Micro economics and Indian Economy.**

**Paper second: Indian Economy**

* Understand the fundamentals of micro economics get an introduction to supply and demand and the basic forces that determine equilibrium in market economy.
* To study about firms and their decisions about of final production.
* They know the development process in India after independence.
* Understand the problems and measures in their contextual perspective.
* Identify and analyze current issues of the economy including agriculture, industrial, business and government.

**B.A. Second Year**

**Paper first: principals of macro economics .**

**Paper second : money banking and public finance.**

Using employment and national income statistics students will be able to describe and analyze the economy in quantitative terms, trade cycle, international trade theories, terms of trade, tariff and quata.

* The students will be able to understand the meaning , objective and function of IMF, World Bank and WTO.

**B. A. Final Year**

**Paper First : development and Environmental economics.**

**Paper second : statistical Method**

* To enable the student to understand the theories and strategies of growth and development.
* To impart knowledge about the issues relating to sustainable development, Environment protection and pollution control measures.

Student after studying statistical methods will develop a realistic approach towards econo**Department of Economics**

**Program outcomes and course outcomes**

By completion of the program the students will able to understand the basic concepts fundamental principal related to economics and their relevance in the day to day life. Economics is the study of how societies, government, households and individuals allocation their scare resources.

The studies of economics can also provide valuable knowledge for making decision in everyday life and use of resources.

**B.A. First Year**

**Paper First: Principals of Micro economics and Indian Economy.**

**Paper second: Indian Economy**

* Understand the fundamentals of micro economics get an introduction to supply and demand and the basic forces that determine equilibrium in market economy.
* To study about firms and their decisions about of final production.
* They know the development process in India after independence.
* Understand the problems and measures in their contextual perspective.
* Identify and analyze current issues of the economy including agriculture, industrial, business and government.

**B.A. Second Year**

**Paper first: principals of macro economics .**

**Paper second : money banking and public finance.**

Using employment and national income statistics students will be able to describe and analyze the economy in quantitative terms, trade cycle, international trade theories, terms of trade, tariff and quata.

* The students will be able to understand the meaning , objective and function of IMF, World Bank and WTO.

**B. A. Final Year**

**Paper First : development and Environmental economics.**

**Paper second : statistical Method**

* To enable the student to understand the theories and strategies of growth and development.
* To impart knowledge about the issues relating to sustainable development, Environment protection and pollution control measures.
* Student after studying statistical methods will devmics. He becomes more analytical in his life.
* Statics also teaches him to check and verify theoretical approach. He can analyze data and more clarity is attained in his findings, be it economic or real life.

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4. mPp 'kSf{kd Lrj ij fgUnh dFkk lkfgR; ,oa dfork fdl izdkj egRoiw.kZ Hkwfedk fuHkk ldrh gS] bl fo"k; esa ikB~;Øe ls xaHkhjrk ls tkuk tk ldrk gSA
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6. vkt HkweaMyhdj.k dk ;qx gS fganh dfork ,oa dFkk lkfgR; vU; ns'kksa esa Hkh ekuoh; vkpj.k lqn`<+ djus esa egRoiw.kZ Hkwfedk fuHkk ldrk gSA ;g ikB~;Øe ekuoh;rk ds fofo/k igyqvksa dks g`n;axe djus esa leFkZ gSA
7. lkfgR; ds v/;;u ls fo|kfFkZ;ksa esa Hkkjr dh ,drk vkSj lkekftd lejlrk dk Hkko fodflr gksxk rFkk uSfrd ewY;ksa dk fodkl gksxkA
8. lkfgR; ds v/;;u ls dyk] foKku] i;kZoj.k] vkSj izd`fr ds izfr laosnu'khyrk fodflr gksxhA

**संगीत विभाग**

**प्रोग्राम संम्बन्धी आउटकम**

1-संगीत किसी व्यक्ति काध्यान केन्द्रित कराने में मदद करता है।     संगीत किसी का मूड अच्छा करने में मदद कर सकता है।

2.- यह शिल्प कौशल और संरचना विकसित करने में मदद करता है।

3-आत्म अभिव्यक्ति के रूप में यह सामाजिक कौशल को बेहतर बनाने   में मदद कर सकता है।

4- तनाव से मुक्ति दिलाने का सशक्त माध्यम है। यह मस्तिष्क   कोविकसित करने में मदद  करता है।

5-संगीत गणित आधारित कला है, अतः इससे गणितीय संकेत में भी   मदद मिलती है।

6- संगीत समाज को जोड़ने में मदद गार है। संगीत के माध्यम से   सृजन शक्ति मजबूत होती है।

7- संगीत के माध्यम से सभ्यताए संस्कृतिए आर्थिक स्थिति , धर्म, लोक रूचि एवं भाषा समझा जा सकता है।

**पाठ्यक्रम सम्बन्धी आउटकम**

1-यह पाठ्य क्रम भारत के इस क्षेत्र के विद्यार्थियों को प्राचीन संस्कृति से अवगत कराने का प्रयास करता है।

2-विद्यार्थियों के बौद्धिक एवं शारीरिक विकास के साथ ही संस्कारित करने का प्रयास भी करता है।

3- संगीत के आधार भूत ज्ञान का अभ्यास करने का अवसर प्रदान करता है। स्थानीय संगीत कला से परिचय कराता है। संगीत के विविध आयाम से परिचय कराता है , जो कि विद्यार्थियों के लिए आवश्यक है।

4- शास्त्रीय संगीत के सामान्य तकनीकी सिद्धांतों से परिचय कराता है। स्वर, लय एवं ताल का ज्ञान कराता है।

5-स्वर लिपियों के तकनीकी पक्ष की जानकारी प्रदान करता है।

6 -वाद्य यंत्रों के बजाने एवं गाने की विस्तृत जानकारी प्रदान करता है। सबसे महत्व पूर्ण अंगतालों की विस्तृत जानकारी प्रदान करता है। ;जिस के बिना गायन एवं नृत्य भी सम्भव नही है।

डॉ रश्मि तिवारी

विभागाध्यक्ष संगीत

शासकीय विवेकानन्द स्नातकोत्तर

महाविद्यालय मनेन्द्रगढ़

जिला . एमसीबी (छ.ग.)

**Department of English**

Program - Course outcome 2022 -23

B.A. English Literature

1. To acquire an ability to read and understand various literary genres and write critically.

2. To demonstrate a critical aptitude and reflexive thinking to systematically analyze the scholars of the English Studies.

3. To demonstrate a set of basic skills in literary communication and explication of literary practices with clarity.

Program - Course Outcome

B.A. /B.Sc./B.Com,/ B.C.A. Ist year.

1. To give the students a first -hand knowledge of Historical and Cultural Heritage of India.

2. To enrich their vocabulary and improve their grammar through various exercises.

3. To develop the 4 basic skills of English language - LSRW in students.

4. To enable them to write a Paragraph on given topics, formal and informal letters, and answers for the Unseen passage.

B.A./B.Sc./ B.Com./ B.C.A. IInd year

1. To give the students a first -hand knowledge of Major Indian Scientists and their contribution in scientific research.

2. To have mastery of language for understanding the basic concepts of grammar and vocabulary.

3. To develop the skill of expansion of an idea through the use of Idioms and proverbs.

4. To develop their writing skills through Report writing on various topics.

B.A./ B.Sc./ B.Com./ B.C.A. III rd year

1. To give the students a first -hand knowledge of Aspects of Development through the problems of Third World Countries.

2. To generate among students the knowledge, awareness, modern outlook and total view of life.

3. To enable them to write Essays and Precise writing on the given topics.

4. To improve the understanding of grammar and prepare them for competitive exams.

Note : The courses of all the three years are designed to give knowledge of English language for the development of Communication skills.

Dr. Shrabani Chakravorty

HOD Dept of English

Govt.Vivekanand P.G. College

Mahendragarh (MCB) CG

**COURSE OUTCOME & PROGRAM OUTCOMES FROM HOME SCIENCE**

College incorporates the Home Science as one of the subject under Bachelor of Arts program. As a part of curriculum the students enrolled for Home Science gets a golden opportunity to learn the Human Anatomy, Physiology, Distant Education, Home Management, Home Economics, Textile Science, Washing, Tie & Dye, Boutique and Bandhini as some of the special arts along with hands on and know how to develop their skills. Students enrolled for Home Science develop a scientific aptitude while they get to study the important aspects of Human Development and human Diet & Nutrition. As a result they deeply contribute to the well being, prosperity and happiness of the family and the society as a whole. Students get to acquire a good knowledge of diet plan and diet therapy for various illness. It leads to develop a good immunity system, healthy life and disease free society.

Home Science provides high opportunities for self employment. Students can operate their own boutiques by having developed the skill of sewing and weaving. Various small scale home based business can be started. Business can be expanded through entrepreneurship by making Self Help groups and achieve financial independence. Home Science plays a very important role in building and developing a healthy, wealthy and prosperous nation.

Home science plays a important role in teaching the ultimate utilisation of resources which are available for human in the most effective and scientific manner. It also provides the knowledge and inculcates the aptitude to solve the various family problems .

**Department of Political Science**

**Program Outcome (B.A. M.A. Political Science):-**

1) Through the study of important philosophical, theoretical and ideological foundations in the study of political science, students are expected to develop critical thinking and arguments.

3) Students will have an understanding on the international political system as it is and as it ought to be.

4) Learning the fundamentals of Indian government and politics is important for Indian students and has a job-prospect particularly in civil services and other competitive examinations.

examinations. 5) By studying organizational and administrative behaviour in public administration, students are expected to acquire leadership and management skills.

5) Students will learn the principles of equality and think for the equal participation of women in the political system.

**Course Outcome (B.A. M.A. Political Science):-**

1. Analyzing what is Politics and explaining the approaches to the Study of Political Science – Normative, Behavioral, Post Behavioral, Feminist.

2.Understanding basic concepts of Liberty, Equality, Rights, Law and Justice.

3.Investigating the nature and scope of Comparative Politics.

4.Critically analyzing the features of a liberal democratic and socialist political system with focus on UK, USA and the People’s Republic of China.

5.Critically analyzing the important institutions of the Indian Union: the Executive: President; Prime Minister, Council of Ministers; Governor, Chief Minister and Council of Ministers; The legislature: Rajya Sabha, Lok Sabha, Speaker, Committee System, State Legislature, The Judiciary: Supreme Court and the High Courts: composition and functions- Judicial Activism

**Course Outcome and Program Outcome Department Of Sociology**

**Course Outcome Of Sociology (B.A. M.A.)­:-**

1.Students understood women in India Society With Special Reference to Their Changing Status and Role, Overall Situation of Women, Theories of Gender Relations.

2.Students understood Contributions of Select Indian Sociologist and Social Thinkers.

3.Students are able to understand Overall Situation of Women Under the System of Patriarchy in India, Theories of Gender Relations, Position of Women in India Society.

4.Students understood Socio-economic Framework of Development in India, Field of Development Planning Including Governmental, Non-governmental Agencies.

5.Students understood history of social theory, social and political understanding of the society, thoughts of Karl Marx, Emile Durkheim, Max Weber, August Comte, Herbert Spencer.

6.Students are able to understand industrialization process and work and Problems faced by Labour in Organized and Unorganized Sector.

7.Students understood basic knowledge of Social Structure & Change of Society and major Segment in Social life.

8.Students are able to understand work and industry. And able to understand the Problems faced by Labour in Organized and Unorganized Sector.

9.Students are able to understand social issues and are empowered to face social problems.

10.Students understood discipline and basic concept in sociology and social structure.

**Program Outcome Of Sociology (BA and MA):-**

1.Sociology learning provides initial knowledge about society, social life and social interactions. It prepares an individual to social life by inculcating values, morals, and manners. It gives knowledge about communities in which he interacts like rural urban and tribal communities.

2.The study prepare an individual become useful member of, society and Nations at large. It highlights various problems prevalent in society and measures to come out of it.

3.Critical Thinking: The programme seeks to develop in students the sociological knowledge and skills that will enable them to think critically and imaginatively about society and social issues.

4.Sociological Understanding: The ability to demonstrate sociological understandings of phenomena, for example, how individual biographies are shaped by social structures, social institutions, cultural practices, and multiple axes of difference and inequality.

5.Written and Oral Communication: The ability to formulate effective and convincing written and oral arguments.

6. Better understanding of real life situation: The ability to apply sociological concepts and theories to the real world and ultimately their everyday lives.

7. Analytical thinking: Field survey and preparation of dissertation paper is an inseparable part of Sociology . Students have to collect primary data for census as well as his/her research topic and analyse the data to draw conclusions. So, qualitative and quantitative analytical skills are enhanced.

8. Observation power: a sensible observation power is necessary to identify the research problems in field study. So a perception about human society slowly grows up.

9.Communication skills and Social interaction power: Students of Sociology stream have to work beyond the class room boundary at the time of field study activities. As a result good communication skill develops while interacting with local people.

10.Professional and Career Opportunities: Students will have the opportunity to join professional careers in Sociology and allied fields. Sociology provides an intellectual background for students considering careers in business, social services, public policy, government service, non-governmental organizations, foundations, or academia. This programme lays foundation for further study in Sociology, Social work, Rural Development, Social Welfare and in other allied subjects.