

2.6.1 Teachers and students are aware of the stated programme and course outcomes of the programmes offered by the institution.



LUCKNOW PUBLIC COLLEGE OF PROFESSIONAL STUDIES

BACHELOR OF SCIENCE B. Sc (PCM)

(SESSION 2021-2022)

2.6.1 Teachers and students are aware of the stated programme and course outcomes of the programmes offered by the institution.

BACHELOR OF SCIENCE B. Sc (PCM)

Program Outcomes Bachelor of Science (B. Sc) offers theoretical as well as practical knowledge on different subject areas. These subject areas include Physics, Chemistry, Mathematics and other fields depending on the specialization & combinations a student opts for this programme course is most beneficial for students who have a strong interest and background in Science and Mathematics. The course is also beneficial for students who wish to pursue multi and interdisciplinary science careers in future. It is also the gateway for post-graduation in research in topics pertaining to science.

Programme Outcomes (PO):

- This course forms the basis of science and comprises of the subjects like physics, chemistry and mathematics.
- It helps to develop scientific temper and thus can prove to be more beneficial for the society as the scientific developments can make a nation or society to grow at a rapid pace, especially in medicine, engineering & research.
- After the completion of this course students have the option to go for higher studies i.e., M. Sc and then do some research for the welfare of mankind.
- After higher studies students can join as scientist and can even look for professional job-oriented courses.
- This course also offers opportunities for serving in Indian Army, Indian Navy and Indian Air Force as officers.
- Students after this course have the option to join Indian administrative Services such as IAS, IFS, Allied services IPS etc.
- Science graduates can go to serve in industries or may opt for establishing their own industrial unit.
- After the completion of the B. Sc degree there are various other options available for the science students. Often, in some reputed universities or colleges in India and abroad the students are recruited directly by big MNC's after their completion of the course.
- Apart from the research jobs, students can also work or get jobs in Marketing, Business & Other technical fields. Science graduates also gets recruited in the banking sector working as customer service executives. Students can also find employment in various government sectors.

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Program Specific Outcomes (PSO):

- B.Sc. student is able to concentrate on Chemistry, Physics and Mathematics.
- A student will demonstrate a scientific knowledge of the core physics principles in Mechanics, Electromagnetism, Modern Physics, and Optics.
- He is able to demonstrate basic manipulative skills in algebra, geometry, trigonometry, and beginning calculus.
- The student will determine the appropriate level of technology for use in:
 - a) Experimental design and implementation.
 - b) Analysis & interpretation of experimental data.
 - c) Numerical and mathematical methods in problem solutions.
- He will be able to apply the underlying unifying structures of mathematics (i.e., sets, relations and functions, logical structure) and establish the relationships among them.
- He can investigate and apply mathematical problems and solutions in a variety of contexts related to science, technology, business and industry, and illustrate these solutions using symbolic, numeric, or graphical methods.
- The student will acquire knowledge of Chemical Thermodynamics, Kinetics, Electrochemistry, Atomic Structure, Organic Chemistry, Spectroscopy and Skill in Industrial Chemistry.
- He will gain knowledge of Geography in Indian Context and also Global Geography. He will know about forests, mountains, lakes, rivers, soil & environment pollution
- A non-medical student can join Indian Air Force, Indian Navy and can also go for other competitive exams. He can go for higher studies in Mathematics, Chemistry and Physics.
- He can join as a scientist in research institutes of immense knowledge having a great scope for growth and development. He can prove to be an asset for the society by producing something more innovative schemes.
- Banking sector is another good option for students of science with good mathematical background.

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SYLLABUS

| COURSE | | PAPER No. | PAPER NAME | MARKS | CREDITS |
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| | | PAPER-1 | MECHANICS AND WAVE MOTION | 100 | 8 |
| | | PAPER-2 | OPTICS | 100 | 8/4 |
| | | CHEMISTRY | | | |
| | | PAPER-1 | INORGANIC CHEMISTRY | 100 | 8 |
| | | PAPER-2 | ORGANIC CHEMISTRY | 100 | 8/4 |
| | | MATHEMATICS | | | |
| | PAPER-1 | DIFFERENTIAL CALCULUS | 100 | 4 | |
| | PAPER-2 | MATRICES AND ALGEBRA | 100 | 4 | |
| | CO-CURRICULUM | | | | |
| | | | | 100 | 4 |
| | SEM-II | PHYSICS | | | |
| | | PAPER-1 | ELECTRICITY AND MAGNETISM | 100 | 4 |
| | | PAPER-2 | MECHANICS, ELECTRICITY & MAGNETISM AND OPTICS LAB | 100 | 4 |
| CHEMISTRY | | | | | |
| PAPER-1 | | PHYSICSL CHEMISTRY | 100 | 4 | |
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| MATHEMATICS | | | | | |
| PAPER-1 | INTEGRAL CALCULUS | 100 | 4 | | |
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| YEAR-2 | SEM-III | PHYSICS | | | |
| | | PAPER-1 | ELECTRICITY AND MAGNETISM | 100 | 8 |
| | | PAPER-2 | PRACTICAL PHYSICS | 100 | 8/4 |
| | | CHEMISTRY | | | |
| | | PAPER-1 | PHYSICAL CHEMISTRY | 100 | 4 |
| | | PAPER-2 | PRACTICAL CHEMISTRY | 100 | 8/4 |
| | | MATHEMATICS | | | |
| | PAPER-1 | ALGEBRA | 100 | 4 | |
| | PAPER-2 | MATHEMATICAL METHODS | 100 | 4 | |
| | SEM-IV | PHYSICS | | | |
| | | PAPER-1 | THERMAL PHYSICS AND ELEMENTARY STATISTICAL MECHANICS | 100 | 4 |
| | | PAPER-2 | ELEMENTS OF MODERN PHYSICS | 100 | 4 |
| | | CHEMISTRY | | | |
| | | PAPER-1 | INORGANIC CHEMISTRY | 100 | 4 |
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| MATHEMATICS | | | | | |
| PAPER-1 | DIFFERENTIAL EQUATIONS | 100 | 4 | | |
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| YEAR-3 | SEM-I | PHYSICS | | | |
| | | PAPER-1 | ELECTRONICS | 100 | 4 |
| | | PAPER-2 | NUCLEAR PHYSICS | 100 | 4 |

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|---------------|---|--|------------|----------|
| SEM-VI | PAPER-3 | PRACTICAL PHYSICS | 100 | 4 |
| | CHEMISTRY | | | |
| | PAPER-1 | ORGANIC CHEMISTRY | 100 | 4 |
| | PAPER-2 | PHYSICAL CHEMISTRY | 100 | 4 |
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| | MATHEMATICS | | | |
| | PAPER-1 | NUMERICAL ANALYSIS | 100 | 4 |
| | PAPER-2 | LINEAR ABSTRACT ALGEBRA | 100 | 4 |
| | PAPER-3 | LINEAR PROGRAMMING | 100 | 4 |
| | PHYSICS | | | |
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| | CHEMISTRY | | | |
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| | MATHEMATICS | | | |
| PAPER-1 | ANALYSIS | 100 | 4 | |
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| PAPER-3 | DISCRETE MATHEMATICS | 100 | 4 | |

COURSE OUTCOMES

SEMESTER- I

THEORY

MECHANICS & WAVE MOTION

PAPER CODE: PHY-101

- The students would clearly understand the conflict between Newtonian mechanics and Special Relativity and thus would know how the progress of the revolutionary scientific ideas is made through logical evidences and observations.
- They would be able to understand the differences between inertial and non-inertial frames and see how pseudo-forces arise in non-inertial frames.
- They would have a clear understanding of the dynamics of conservative and non-conservative forces in real life such as in gravitational fields or mechanical systems having friction etc.
- They would feel the thrill to know that the same set of laws that work for planetary and galactic motions also work in our daily life. Further, they

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would be able to do mathematical calculations with application of these laws to various objects and artificial satellites.

- They would be able to understand and calculate various macroscopic elastic properties as the response of the widely used materials through the application of simple classical laws.
- The students would be able to understand and apply the properties of oscillations (natural, damped and forced), and waves and appreciate their omnipresence in various phenomena around us.

THEORY

OPTICS

PAPER CODE: PHY-102

- The student will get an introduction to the discipline of optics and its role in daily life.
- The optics course will give the student a basic knowledge of interference, diffraction and polarization.
- The student will be able to analyze and calculate interference between light waves and application of the theory to various interferometers along with their practical applications.
- The student would know the conditions for near and far-field diffraction and be able to calculate the far-field diffraction from gratings and simple aperture functions.
- The student would understand how the polarization of light changes at reflection and transmission at interfaces.

THEORY

DIFFERENTIAL CALCULUS:

PAPER CODE: P-1

A student will be able to:

- Know the concepts of calculus, namely, limits, continuity, differentiability of functions of one and two variables and their applications in the form of mean value theorem and Taylor's theorem.
- Sketch curves in a plane using its mathematical properties in the different coordinate systems of reference.

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- Apply derivatives in Optimization, Social sciences, Physics and Life sciences etc.
- Get knowledge of curvature, asymptotes, envelopes and evolutes.

THEORY

MATRICES AND ALGEBRA:

PAPER CODE: P-2

A student will be able to:

- Find the rank and eigen values of matrices.
- Study the system of linear homogeneous and non-homogeneous equations.
- Recognize the mathematical objects that are groups, and classify them as abelian, cyclic and permutation groups, etc.
- Link the fundamental concepts of Groups and symmetrical figures.
- Analyze the subgroups of cyclic groups.
- Explain the significance of the notion of cosets, normal subgroups, and factor group.
- Understand the concepts of rings, subrings and fields.

THEORY

INORGANIC CHEMISTRY:

PAPER ONE

A student will be able to:

- Structure of atoms and associated important rules, importance of chemistry of elements.
- Ionic, covalent and non-covalent bonding which always play pivotal role in deciding the chemistry and properties of any compound/material.
- Periodic properties of elements and several parameters associated with elements.
- Solid state chemistry which forms the basis of the development of targeted crystalline solids inculcating varied defects which induces variety of materials properties viz. piezoelectricity.
- Chemistry of elements belonging to s-block, noble gases and main group.

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THEORY

ORGANIC CHEMISTRY:

PAPER 2

A student will be able to:

- Understand different organic compounds with respect to the functional group and thus capable to name the organic compounds as per IUPAC nomenclature.
- Understand the basics of chemical reactions i.e. Substrate and Reagent, types of Reagents, Electrophilic and Nucleophilic Homolytic and Heterolytic fission. Electron mobility, Inductive effect etc.
- Recognize and draw constitutional isomers, stereoisomers, including enantiomers and diastereomers, racemic mixture and meso compounds.
- Understand fundamental principles of organic chemistry and predict outcomes and derive mechanism of various types of organic reactions.
- Understand various types of reactive intermediates and factors affecting their stability.
- Understand the nomenclature, synthesis, isomerism and physical properties of alkanes and cycloalkanes.
- Understand the concept of Aromaticity of benzenoids & non-benzenoids, the preparation, reactivity & structure of aromatic compounds.
- Learn the preparations, reactivity & stereochemistry of SN1 & SN2 reactions of Halogen compounds.

CO-CURRICULUM

SEMESTER II

THEORY

ELECTRICITY AND MAGNETISM:

PAPER 3(PHY201)

After successful completion of this course, students will:

- Understand the basic mathematical concepts related to Electromagnetic fields, and use the understanding of calculus along with basic principles to solve problems encountered in science.

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- Comprehend and apply the understanding of fundamental laws and concepts in electricity and magnetism, primarily with regard to Maxwell's laws, to explain natural physical processes and related technological advancements.
- Learn about the origin and basic properties of static as well as dynamic Electric and Magnetic fields, and the kinds of physical phenomena they generate - Electromagnetic waves and their properties.
- Account for the importance of electricity and magnetism in society, especially with regard to technological applications.
- Visualize and design experiments based on the basic concepts of electricity and magnetism, and obtain information in order to explore physical principles.

PRACTICAL

MECHANICS, ELECTRICITY & MAGNETISM AND OPTICS LAB:

PAPER 4(PHY202)

Experimental physics has the most striking impact on the industry wherever the instruments are used to determine the thermal and electronic properties. The following outcomes are expected by this laboratory course:

- Students will achieve measurement precision.
- Students will verify the conceptual learning through experiments in these areas.
- Students will better appreciate the theoretical concepts in mechanics, electricity and magnetism, and optics through experiments.
- Online Virtual Lab Experiments are expected to give insight in the simulation techniques, and provide basis for modeling

THEORY

PHYSICAL CHEMISTRY:

PAPER 1

- Students would gain knowledge regarding the basic of computers and mathematical concepts of log, permutation and combination, differential and integration of some relevant functions.

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- Student would gain understanding of gaseous state, critical phenomenon, liquid state, solid state, colloidal state and liquid crystals.
- It would help students recognize the importance of chemical kinetics and catalysis.
- Understand the problems related to electrode potential, Nerst equation, electrochemical series its significance, reversible and irreversible cells, concentration cells with and without transport, Potantiometric titrations.

PRACTICAL

PRACTICAL CHEMISTRY:

PAPER 4 (P4)

- The student will be able to Analyze the given mixture and identify anions and cations present.
- Achieve knowledge about different types of reaction.
- Understand various tests to identify the radicals.
- Able to write reactions and structure.
- Acquire the skill to perform the experiment in the real lab once they understand different steps in the procedure.
- Having expertise in making solutions accurately.
- To acquire enough knowledge to answer questions based on experiments.

THEORY

INTEGRAL CALCULUS:

PAPER 3

- Some of the families and properties of Riemann integrable functions, and the applications of the fundamental theorems of integration.
- Beta and Gamma functions and their properties.
- The valid situations for the inter-changeability of differentiability and integrability with infinite sum, and approximation of transcendental functions in terms of power series.
- Compute area of surfaces of revolution and the volume of solids by integrating over cross-sectional areas.

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THEORY

GEOMETRY:

PAPER 4

- To learn and visualize the fundamental ideas of coordinate geometry.
- To describe some surfaces by using analytical geometry.
- To gain knowledge about regular geometrical figures and their properties.

SEMESTER III

THEORY

ELECTRICITY & MAGNETISM:

PAPER CODE:

- Understand the basic different parameters of electricity, magnetism and dielectric. These parameters are able to calculate the electric field and magnetic field and also able to understand their related problems.
- Understand the intensity and potential of different conducting and non conducting bodies in different mediums.
- Understand the concepts of different type of electric and magnetic laws in electrical and magnetic circuits.
- Understand the problems related to Amper's law, Bio- Savert's law, Fleming's left and right hand rules, Faradey's law, Poisson equation, Laplace equation.

PRACTICAL

PRACTICAL PHYSICS

PAPER CODE:

- Electronic practical prepare the students to be well versed with the electronic equipments used in various fields of medical, education and engineering.
- Students after studying theory can now implement it practically. It teaches them how to use diode, transistor, to find magnetic field, ballistic galvanometer and many more.

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THEORY

PHYSICAL CHEMISTRY:

PAPER CODE:

- Understand the basic parameters of thermodynamics and able to calculate w , q , dU and dH also able to understand entropy related problems.
- Will be able to calculate the efficiency of Carnot Engines, Claperyon-Clausius equation and spontaneity and equilibrium in ideal gas and mixing of gases.
- Understand the concepts of different type of conductivity of electrolytes, Kohlrausch's law and transport number.
- Understand the problems related to electrode potential, Nerst equation, electrochemical series its significance, reversible and irreversible cells, concentration cells with and without transport, Potantiometric titrations.

PRACTICAL

PRACTICAL CHEMISTRY

PAPER CODE:

- Understand the reaction rates of hydrolysis of esters in presence of acidic medium.
- Understand the distribution of a chemical between polar and non polar solvents.
- Understand the preparation of sols and also able to compare the precipitating powers.
- Understand the determination of percentage composition of given binary mixture by viscosity method and surface tension method.
- Understand the heat of solution and heat of neutralization.
- Understand the sublimation, crystallization and identification of an organic compound.

THEORY

MATHEMATICAL METHODS:

PAPER CODE:

- Understand the limit, continuity and differentiability, technique of maxima & minima of two variables and Jacobians.

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- Understand the Laplace transforms with application as well as Fourier series, Fourier transforms and Fourier integrals etc.
- Understand the calculus of variation with fixed boundaries only.

\THEORY

ALGEBRA:

PAPER CODE:

A student will be able to:

- Assess properties implied by the definitions of groups and rings,
- Use various canonical types of groups (including cyclic groups and groups of permutations) and canonical types of rings (including polynomial rings and modular rings),
- Analyze and demonstrate examples of subgroups, normal subgroups and quotient groups,
- Analyze and demonstrate examples of ideals and quotient rings,
- Use the concepts of isomorphism and homomorphism for groups and rings, and Produce rigorous proofs of propositions arising in the context of abstract algebra.

SEMESTER IV

THEORY

THERMAL PHYSICS AND ELEMENTARY STATISTICAL MECHANICS:

PAPER CODE:

A student will be able to:

- Understand and use basic terms for the description of the motion of particles, vector functions and the fundamental laws of Newtonian mechanics.
- Solve mechanics problems in one dimension that involve one or more of the forces of gravity, friction and air resistance.
- Understand the concept of virtual work, stable and unstable equilibrium, catenary of uniform strength.
- Apply Newton's second law in vector form to problems in more than one dimension
- Solve problems relating to the motion of a projectile in the absence of air resistance.
- Understand the concept of Kinematics and Kinetics by vel. & acc. Along radial and transverse directions.

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- Study of S.H.M., motion under law of forces, motion in resisting medium, constrained motion, motion on smooth and rough plane curve by a particle.
- Understand the concept of motion of a particle in different coordinate system

THEORY

ELEMENTS OF MODERN PHYSICS:

PAPER CODE:

- Understand the Inadequacies of classical mechanics, new form to understand physics by Einstein explanation on Light wave, de-broglie wave concepts, plank's hypothesis and Heisenberg's uncertainty principle
- Understand the mathematical concepts by Schrodinger, calculation of eigenvalues, Normalization of wave function, Vector model.
- Understand the atomic model by Rutherford, Bohr, Gerlach and Pauli's exclusion principle.
- Understand the most important phenomena in physics as Zeeman effect, Hydrogen spectrum, Photoelectric effect and Compton Scattering
- Understand the experiments of Davisson and Germer experiment, Hertz experiment, Stern-Gerlach experiment.

THEORY

DIFFERENTIAL EQUATIONS:

PAPER CODE:

- Understand the second order linear differential equations, use of known solution to find another solution, undetermined coefficient and variation of parameters.
- Understand the series solutions of differential equations, power series methods, Bessel, Legendre, Hyper geometric functions and there properties .
- Understand the orthogonality of functions, Sturm-Liouville's problem and orthogonality of Bessel, Legendre, Hyper geometric functions .
- Understand linear system, homogeneous linear system with constant coefficient and non linear differential equation.

THEORY

MECHANICS:

PAPER CODE:

A student will be able to:

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- Understand and use basic terms for the description of the motion of particles, vector functions and the fundamental laws of Newtonian mechanics.
- Solve mechanics problems in one dimension that involve one or more of the forces of gravity, friction and air resistance.
- Understand the concept of virtual work, stable and unstable equilibrium, catenary of uniform strength.
- Apply Newton's second law in vector form to problems in more than one dimension
- Solve problems relating to the motion of a projectile in the absence of air resistance.
- Understand the concept of Kinematics and Kinetics by vel. & acc. Along radial and transverse directions.
- Study of S.H.M., motion under law of forces, motion in resisting medium, constrained motion, motion on smooth and rough plane curve by a particle.
- Understand the concept of motion of a particle in different coordinate system.

THEORY

INORGANIC CHEMISTRY:

PAPER CODE:

- Chemistry of transition and inner-transition elements. These insights are important as they help in the rational selection of the cations of these elements for tailor-made syntheses of newer complexes.
- Concepts of coordination chemistry and their applications.
- Importance of different acid-base concepts which forms the basis of rational ligand designing and coordination complex formation for specific bio-inorganic, materials and optoelectronic applications.
- Importance and different chemical aspects of non-aqueous solvents which now-a-days are gaining importance in varied targeted syntheses of drugs and materials for technological applications.

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THEORY

ORGANIC CHEMISTRY:

PAPER CODE:

- The preparation and chemical reactions of Alcohols and Epoxides -Alcohols Dihydric alcohols: (Ethylene Glycol) Trihydric alcohols: (Glycerol).
- Understanding the order of reactivity of different carboxylic acid derivatives and the reactivity of different carboxylic acid derivatives.
- Able to recognize structures of acid halides, esters, amides, acid anhydrides.
- Able to write down structure of phenol and phenoxide ion and chemical reactions of phenols.
- Know the mechanism of named reactions of carbonyl compounds and condensation reactions as well as their use in food and pharmaceuticals.

SEMESTER V

THEORY

NUCLEAR PHYSICS

PAPER CODE:

- Grasp the knowledge about basic nuclear properties and nuclear models for a better understanding of nuclear reaction dynamics.
- Analyze quantum mechanical phenomena in nuclear physics and develop an understanding of quantum mechanics also.
- Comprehend the general understanding of phenomena like nuclear fusion and fission and develop the skills required for solving basic problems in nuclear physics at different nuclear energy ranges.
- Develop the basic understanding of accelerator physics and particle detectors.
- Acquire and apply basic nuclear physics knowledge in subjects such as medicinal, archaeology, geology, and other multidisciplinary fields of Physics and Chemistry.

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PRACTICAL

PRACTICAL PHYSICS

PAPER CODE:

- The student will get an introduction to the discipline of optics and its role in daily life.
- The optics course will give the student a basic knowledge of interference, diffraction and polarization.
- The student will be able to analyze and calculate interference between light waves and application of the theory to various interferometers along with their practical applications.
- The student would know the conditions for near and far-field diffraction and be able to calculate the far-field diffraction from gratings and simple aperture functions.
- The student would understand how the polarization of light changes at reflection and transmission at interfaces.

THEORY

ELECTRONICS

PAPER CODE:

- The student will understand about Utility of Zener Diode and Uni-junction Transistor.
- The student will be able to understand basic electronic devices and their applications.
- The student will be able to learn Transistor biasing.
- The student will understand the concept of frequency response, bandwidth and audio amplifiers.
- The student will be able to Feedback circuits.
- The student will be able to get the importance of amplitude modulation and demodulation.
- The student will understand the applications of various Logic Gates and Special Photonic Devices.

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THEORY

NUMERICAL ANALYSIS

PAPER CODE:

- Understand solution of system of equations using various methods.
- Solution of linear and non-linear equations.
- Learns about boundary value problems and characteristic value problems.
- To describe matrix concept and linear equations.
- Identifies numerical differentiation.
- Evaluate numerical integrations.
- Understand the concept of difference equations.
- Distinguish methods of Taylor series, Euler's, Modified Euler's and RungeKutta methods to find solutions of differential equations.
- Estimates the numerical solutions of first order differential equations.

THEORY

LINEAR & ABSTRACT ALGEBRA

PAPER CODE:

- The fundamental concept of Rings, Fields, subrings, integral domains and the corresponding morphisms.
- The concept of linear independence of vectors over a field, the idea of basis and the dimension of a vector space.
- Basic concepts of linear transformations, the Rank-Nullity Theorem, matrix of a linear transformation and the change of basis.
- Automorphisms for constructing new groups from the given group.
- Group actions, Sylow theorems and their applications to check no simplicity.
- Compute inner products and determine orthogonality on vector spaces.

THEORY

LINEAR PROGRAMMING PROBLEM

PAPER CODE:

- Student will be able to understand the concept of linear programming problems and their basic feasible solutions.
- Student will be able to understand the concept of convex set and simplex method.

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- Student will be able to discuss artificial variable with big M method, Two phase method and revised simplex method.
- Student will be able to discuss the problems of duality in linear programming problem, dual simplex method as well as particle dual method as well as primal dual method integer programming.

THEORY

ORGANIC CHEMISTRY:

PAPER CODE:

- The organometallic compounds such as Grignard reagent which have been widely used on both laboratory and commercial scale and is one of the most common organometallic reagents used for the formation of carbon-carbon bonds. Organosulphur compounds which have therapeutic use and pharmacology.
- Understanding Carbohydrate, its classification and use in the food industry etc.
- Understand Protein, amino acid and peptides. Chemical structure of RNA and DNA.
- Determination of saponification value, acid value and iodine value of oil. Synthetic detergent.
- Various polymers, their method of polymerization and their use in industry.

THEORY

PHYSICAL CHEMISTRY:

PAPER CODE:

- After the completion of the semester student will acquire knowledge of introductory quantum mechanics, dipole moment and photochemistry. He will also be get familiar with dilute solutions, colligative properties and experimental methods of determining various colligative properties. He will learn the third law of thermodynamics, distribution law, phase rule and their derivation.

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PRACTICAL

PRACTICAL CHEMISTRY:

PAPER CODE:

- Student will be able to synthesize different type of coordination compounds in laboratory like potassium trioxalatoferrate (III), $K_3[Fe(C_2O_4)_3]$, Ni-DMG complex, $[Ni(DMG)_2]$, copper tetraamine complex, $[Cu(NH_3)_4]SO_4$, cis-and trans-bisoxalatodiaqua chromate (III) ion.
- Students will be able to verify Beer-Lambert law for $KMnO_4/K_2Cr_2O_7$ and determine the concentration of the given solution.
- Students will be able to determine of Fe^{3+} content by thiocyanate method and Separation and estimation of $Mg(II)$ and $Zn(II)$. Chromatographic separation of metal ions
- Students will be able to separate and identify the mixture of two organic compounds and one step preparation.
- Students will be able to determine the strength of the given acid conductometrically using standard alkali solution.
- Students will be able to determine the solubility and solubility product of a sparingly soluble electrolyte conductometrically.
- Students will be able to determine the ionization constant of a weak acid conductometrically.
- Students will be able to verify law of refraction of mixtures (e.g. of glycerol and water) using Abbe's refractometer.
- Students will be able to determine the specific rotation of cane sugar solution by polarimeter.
- Students will be able to determine of molecular weight of a non-volatile solute by Rast method/Beckmann freezing point method.
- Students will be able to determine the apparent molecular weight of non volatile solute at different concentration and determine Van't Hoff factor by ebullioscopy.

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SEMESTER-VI

THEORY

INORGANIC CHEMISTRY:

PAPER CODE: PAPER-9

- Semi-modern concepts of metal ligand bonding in coordination complexes.
- Theories of electronic absorption and magnetic properties of coordination complexes. The fine tuning these two very important parameter lead to the design and fabrication of compound, metal-organic frameworks, coordination polymers for optoelectronic and single-molecular magnets (SMM).

THEORY

INORGANIC CHEMISTRY:

PAPER CODE: PAPER-10

- Inorganic polymers viz. silicones which find applications in materials pharmaceutical industries and surgery too. Phosphazenes which in last couple of years had witnessed significant development as emerging smart materials.
- Class-a and class-b donor-acceptors, symbiotic relationship.
- Organometallic and bioinorganic concepts which in any of the previous semesters have not been accounted.

THEORY

ORGANIC & PHYSICAL CHEMISTRY:

PAPER CODE: PAPER-11

- Infrared spectroscopy in which characteristic absorptions of various functional groups.
- Ultraviolet absorption spectroscopy, Beer Lambert Law, types of electronic transitions and the effect of conjugation and concept of chromophore and auxochrome.
- Nuclear magnetic resonance, interpretation of NMR spectra of simple organic molecule.
- Quantum mechanics as well as of spectroscopy. They will have comprehensive understanding of valence bond model and molecular orbital model.

2.6.1 Teachers and students are aware of the stated programme and course outcomes of the programmes offered by the institution.

THEORY

ELEMENTS OF RELATIVISTIC AND CLASSICAL MECHANICS

PAPER CODE:

- Understand the frame of reference (Earth), different transformation equations, special theory of relativity given by Einstein, D' Alembert Principle, Lagrangian and Hamiltonian equation.
- Understand the variation of mass with velocity, energy mass equivalence formula, rigid body problems and their solutions.
- Understand the reduced mass, inadequacy of classical mechanics, phase space, Inverse square Kepler's law, Liouville's theorem, ensembles, connection between different ensembles, thermodynamic quantities and classification of orbits.
- Understand the Maxwell Boltzmann statistics, Maxwell velocity distribution law, Fermi – Dirac and Bose – Einstein statistics, electron gas, Vander Wall's gas and Plank's oscillator.

THEORY

SOLID STATE PHYSICS

PAPER CODE:

- Understand the classification of crystal structure, Primitive vectors, lattice constant, miller indices, point groups and space groups, crystal structure of NaCl, CsCl, ZnS and Diamond.
- Understand the Packing fraction, Reciprocal lattice, spacing between lattice planes, Diffraction pattern in crystal structure, Brag's Law.
- Understand the lattice vibration, Laue method, Powder method, Band theory of solids, concept of holes, Bloch theorem.

THEORY

MATHEMATICAL METHODS AND NUMERICAL TECHNIQUES

PAPER CODE:

- Understand the measurement precision and perfection is achieved through Lab Experiments.
- Understand the the experiments in advance laboratory will enable students to be industry ready in the field of electronics.

2.6.1 Teachers and students are aware of the stated programme and course outcomes of the programmes offered by the institution.

- Understand the exposure to this laboratory will enable students to do research in applied optics and optoelectronics.
- The students will be able to appreciate the concept of electronic communication.
- Online Virtual Lab Experiments give an insight in simulation techniques and provide a basis for modeling.

THEORY

MATHEMATICAL ANALYSIS:

PAPER CODE:

- Understand the metric space, converges of series of arbitrary terms, uniform convergence of series of sequences and series of functions, Power series etc.
- Understand complex number as ordered pairs, Geometric representation of complex numbers and analytic function.
- Understand complex integration, Cauchy's Integral formula and mapping by elementary functions etc.
- Understand Residues theorem and expansion in series and singularities etc.

THEORY

DIFFERENTIAL GEOMETRY & TENSOR ANALYSIS:

PAPER CODE:

This course gives students basic knowledge of classical differential geometry of curves and surfaces. Among other students will learn and understand the particular interest of some curves and surfaces such as the catenary, the tractrix, the cycloid, the surfaces of constant Gaussian curvature and the minimal surfaces. After successful completion of the course students will be able to:

- Calculate the curvature and torsion of a curve.
- Find the moving trihedron of a curve and write its intrinsic and canonical equations.
- Find the osculating surface and the osculating curve at any point of a given curve.
- Calculate the first and the second fundamental forms of a surface.

2.6.1 Teachers and students are aware of the stated programme and course outcomes of the programmes offered by the institution.

- Calculate the Gaussian curvature, the mean curvature, the curvature lines, the asymptotic lines, the geodesics of a surface.
Use efficiently the mathematical tool of tensor calculus in the study of surfaces.
- Symmetric and antisymmetric tensors. Tensor fields. Stress and strain tensors. Hooke's law. Navier-Stokes equation.

THEORY

DISCRETE MATHEMATICS:

PAPER CODE:

- This course aims at introducing the concepts of lattices, Boolean algebras, switching circuits and graph theory. The course discusses some important applications of Boolean algebra and graph theory in real life situations through switching circuits and shortest path algorithms.