FIFTH SEMESTER								
1	B21PC5010	Physics-V	HC	3	30	70	100	4
2	B21PC5020	Chemistry-VI	HC	3	30	70	100	4
3	B21PC5030	Computational Chemistry	HC	3	30	70	100	4
4	B21PC5040	Mathematics – VI	HC	3	30	70	100	4
5	B21PC5051	Electronics	SC	2	15	35	50	2
	B21PC5052	Solid State Physics						
	B21PC5053	Nuclear Physics						
6	B21PC5061	Hetero Cyclic Chemistry & Chemistry of Natural Products	SC	2	15	35	50	2
	B21PC5062	Polymer Chemistry						
	B21PC5063	Industrial Chemistry						
7	B21PC5071	Complex Analysis	SC	2	15	35	50	2
	B21PC5072	Fluid Dynamics						
	B21PC5073	Number Theory						
		Practicals						
8	B21PC5090	Physics Lab – V	HC	2	15	35	50	3
9	B21PC5X10	Chemistry –V	HC	2	15	35	50	3
10	B21PC5X20	Mathematics-V	HC	2	15	35	50	3
		Total Credits		**24**			**700**	**31**

Fifth Semester

Course Code	Course Title	Course Type	L	T	P	C	Hrs/Week
B21PC5010	**Physics-V**	**HC**	**2**	**1**	**0**	**3**	**4**

Course Objectives:

The Objectives of this course are to make students to learn:

- Acquire knowledge with respect to the basic concepts of Special theory of relativity, Postulates of Special Theory of Relativity, Lorentz transformations, Mass energy equivalence, the principle of equivalence.
- Explain the concepts of Units of stellar distances, Spectral classification of stars, Surface temperature of star and its color, Evolution of stars to white dwarfs and black holes.
- Basic concepts of Quantum Mechanics.
- Students will able to understand the basic concepts of Wave Mechanics.

Course Outcomes:

After the successful completion of course, students are able to understand:

- Understand the basic concepts of Special theory of relativity, Postulates of Special Theory of Relativity, Lorentz transformations, Mass energy equivalence, The principle of equivalence.
- Know the concepts of units of stellar distances, Spectral classification of stars, Surface temperature of star and its colour, Evolution of stars to white dwarfs and black holes.
- Understand the concept of Brief discussion on failure of classical physics to explain black body radiation, Photoelectric effect, Compton Effect.
- The concept of Matter Waves-de Broglie hypothesis. Expression for group velocity and Phase velocity of matter waves. Uncertainty principle.
- Setting up of time dependant and independent Schrodinger's equation, Eigen function and Eigen values, Expression for energy: Particle in a one-dimensional and three infinite potential well.
- Understand the concept of potential barrier and quantum mechanical tunnelling.

UNIT-I **12 hrs**

Special theory of relativity: Michelson-Morley experiment and its outcome. Postulates of Special Theory of Relativity. Lorentz transformations (no derivation). Lorentz contraction. Time dilation. Relativistic transformation of velocity, Relativistic addition of velocities. Variation of mass with velocity. Rest mass. Massless particles. Mass energy equivalence, $E = mc^2$. The energy-momentum relation. The principle of equivalence.

UNIT-II **12 hrs**

Astrophysics: Units of stellar distances- light year and Parsec, luminosities of stars, absolute and apparent magnitude,relation between absolute,apparent magnitude and distance. Expression for radius of the star. Spectral classification of stars: E. C. Pickering classification (Harvard classification). H-R diagram, main sequence stars, general properties of main sequence stars. Surface temperature of star and its color, linear density model of star, expression for average temperature of star, binary stars, stellar masses. Evolution of stars to white dwarfs, different stages, formation of neutron stars and black holes (qualitative).

UNIT-III **12 hrs**

Quantum Mechanics: Brief discussion on failure of classical physics to explain black body radiation, Photoelectric effect, Compton Effect, stability of atoms and spectra of atoms. Compton Scattering-Expression for energy of the scattered photon, kinetic energy of the recoil electron and Compton shift. Matter Waves-de Broglie hypothesis. Expression for group velocity and Phase velocity of matter waves. Uncertainty principle.

UNIT-IV **12 hrs**

Wave Mechanics: Setting up of time dependant and independent Schrodinger's equation. Physical interpretation of wave function. Eigen function and Eigen values. Expression for energy: Particle in a one-dimensionalinfinite potential well(derivation), mention of expression in three dimensions, degeneracy and Particle in a finite potential well (qualitative). Concept of potential barrier and quantum mechanical tunneling.

Reference Books:

- Halliday D, Resnick R, and Walker J, Principles of Physics, 10th Edn., Wiley India Pvt. Ltd. (2013).
- Duggal B D, and Chabra C L, Fundamentals of Modern Physics, 8th Edn., S Nagin Chand and Co. (1997).
- Carroll B W, and Ostlie D A, Modern Astrophysics, 2nd Edn., Addison-Wesley (2007).
- Zeilik M, and Gregory S A, Introductory Astronomy and Astrophysics, 4th Edn, Saunders College Publishing (2009).
- Basu B, An Introduction to Astrophysics, Second Printing, Prentice Hall of India (2001).
- Jain M C, Quantum Mechanics, A Textbook for Undergraduates, PHI India (2007).
- Guptha S L, Kumar V, and Sharma H V, Quantum Mechanics, 28th Edn., Jai Prakash Nath and Co. (2009).
- Beiser A, Concepts of Modern Physics, 6th Edn., TMH, New Delhi (2008).

Course Code	Course Title	Course Type	L	T	P	C	Hrs/Week
B21PC5051	Electronics	**HC**	**2**	**0**	**0**	**2**	**2**

Course Objectives:

The Objectives of this course are to make students to learn:

- Make the students to understand the concepts of BJT characterisitics in CE mode, DC load line analysis, DC h-parameters and their determination.
- Explain the concepts JFET and Integrated Circuits (ICs).
- Basic concepts of Digital Electronics and Communication.
- Students will able to understand the basic concepts Modulation and Demodulation.

Course Outcomes:

After the successful completion of course, students are able to understand:

- Understand the concepts of BJT characterisitics in CE mode, DC load line analysis, DC h-parameters.
- Know the concepts of types, characteristics and parameters of JFET, brief discussion on Fabrication of IC's, types of ICs, IC555.
- Review of basics of number systems. Boolean algebra, truth tables, and Universal gates. Demorgan's theorems.
- Know the Need of modulation, types of modulation, Comparison between FM &AM.Demodulation.

UNIT-I **06 hrs**

Bipolar Junction Transistors: BJT characterisitics in CE mode, DC load line analysis. BJT biasing methods: Mention different types of biasing in CE mode. Analysis of voltage divider method with derivation Ic and VCE. DC h-parameters and their determination, mention of h- parameter model of transistor, analysis of single stage RC coupled CE amplifier using h-parameter.

UNIT-II **06 hrs**

JFET: Types, characteristics and parameters of JFET. JFET as an amplifier (CS mode, qualitative).
Integrated Circuits (ICs): Brief discussion on Fabrication of IC's, types of ICs, IC555 internal configuration.

UNIT-III **06 hrs**

Digital Electronics: Review of basics of number systems. Boolean algebra, truth tables, basic theorems, Universal gates. Demorgan's theorems.
Communication: classification of radio waves; Types of radio wave propagation, radio waves propagation through ionosphere. Critical frequency, critical angle, MUF, virtual height, secant law.

UNIT-IV **06 hrs**

Modulation and Demodulation: Need of modulation, types of modulation, Amplitude modulation(AM): modulation index, frequency spectrum of AM, AM modulator using BJT (emitter modulation). Frequency Modulation (FM): modulation index, FM spectrum, Carson's rule, applications of FM, Comparison between FM &AM.Demodulation: Need for demodulation, AM detection using PIN diode (qualitative).

Reference Books:

- Basic Electronics- B.L.Theraja- S.Chand Publication, New Dehli.
- Integrated Electroniics- Millmans Ans Halkias-McGraw Hill,Newdehli.
- Electronic devices and circuits- Allan Mottersed-.McGraw Hill,Newdehli.
- Basic Electronics linear circuits,TTTI- Bhargav&etal-Bharat Book Prakashan Dharwad.
- Electronics communication system- Kennedy& Davis.

Course Code	Course Title	Course Type	L	T	P	C	Hrs/Week
B21PC5052	Solid State Physics	**HC**	**2**	**0**	**0**	**2**	**2**

Course Objectives:

The Objectives of this course are to make students to learn:

- Acquire knowledge with respect to concepts of crystal structure, Bravais lattices, Seven crystal Systems, Miller indices, expression for inter-planar spacing and crystal structure of NaCl and CsCl.
- Explain the concepts of Crystal diffraction and Specific heat of solids.
- Basic concepts of Free electron theory of metals and Semiconductors.
- Students will able to understand the basic concepts of Magnetic materials and Superconductivity.

Course Outcomes:

After the successful completion of course, students are able to understand:

- Understand the concepts of crystal structure and crystal structure of NaCl and CsCl.
- Know the concepts crystal diffraction, Bragg's law, Bragg's, X-ray spectrometer and classical theory, Einstein's and Debye's theory of lattice specific heats.
- Review of basics of classical free electron model, expressions for electrical and thermal conductivity, Intrinsic and extrinsic semiconductors, Hall effect and expressions for Hall coefficient. Applications of Hall Effect.
- Learn the classification of magnetic materials. Classical Langevin's theory of diamagnetism and paramagnetism.
- Understand the concept of occurrence of superconductivity. Destruction of superconductivity by magnetic field. Meissner effect. Type-I and Type-II super conductors.

UNIT-I **06 hrs**

Crystal structure: Lattice, lattice translational vectors, basis of crystal structure, Types of unit cells, Co-ordination numbers, Bravais lattices, Seven crystal Systems, Miller indices, expression for inter-planar spacing, crystal structure of NaCl and CsCl.

UNIT-II **06 hrs**

Crystal diffraction: X-ray spectrum(Continuous & Characteristic), Bragg's law, Bragg's, X-ray spectrometer.

Specific heat of solids: Experimental facts; classical theory, Einstein's and Debye's theory of lattice specific heats(qualitative).

UNIT-III **06 hrs**

Free electron theory of metals: Classical free electron model, expressions for electrical and thermal conductivity, Wiedemann-Franz law, failure of classical free electron theory.

Semiconductors: Intrinsic and extrinsic semiconductors. Expressionfor electrical conductivity in case of intrinsic semiconductors. Hall Effect and expressions for Hall coefficient. Applications of Hall Effect.

UNIT-IV **06 hrs**

Magnetic materials: Classification of Magnetic materials.Classical Langevin's theory of diamagnetism and paramagnetism. Determination of paramagnetic susceptibility by Gouy's method. Ferromagnetism and Weiss Theory of Ferromagnetism. Ferromagnetic domain.

Superconductivity: Occurrence of superconductivity. Destruction of superconductivity by magnetic field. Meissner effect. Type-I and Type-II super conductors. Isotope effect. BCS theory of superconductivity(Qualitative).Applications of superconductors.

Reference Books:

- Solid State Physics- C.Kittel-Wishey Publishing.
- Solid state physics (I ed)- A.J.Dekkar-McMillan,NewDehli,2003.
- Solid state physics (I ed)- Keer-New age international Pvt. Limited.2002.
- Solid state physics- Kumar and Gupta.
- Solid state physics- Kumar and Gupta and Saxena.

Course Code	Course Title	Course Type	L	T	P	C	Hrs/Week
B21PC5053	Nuclear Physics	**HC**	**2**	**0**	**0**	**2**	**2**

Course Objectives:

The Objectives of this course are to make students to learn:

- Students will able to understand the concepts of The Nucleus, Nuclear forces and Nuclear models.
- Explain the concepts of Nuclear Reactions- Nuclear fission and fusion.
- Concepts of Alpha decay, Beta decay and Gamma decay.
- Students will able to understand the basic concepts of Detectors and Accelerators.

Course Outcomes:

After the successful completion of course, students are able to understand:

- Understand the concepts of properties of nucleus. Discovery of neutron, the proton neutron hypothesis, properties of nuclear forces and various nuclear models.
- Know the concepts different types of nuclear reactions in brief.
- Understand the concept and process of Alpha, Beta, and Gamma decay.
- Learn the variation of pulse height with applied voltage in gas filled detector. Brief explanation of Ionisation chamber and Proportional counter.
- Understand the theory, construction and working of linear accelerators and cyclotron.

UNIT-I **06 hrs**

The Nucleus: Properties of nucleus. Discovery of neutron, the proton neutron hypothesis. Nuclear forces and their characteristics.

Nuclear forces: Properties of nuclear forces, Meson Theory of nuclear forces.

Nuclear models: Liquid-drop model: Semi-emperical mass formula and explanation of the terms, nuclear fission on the basis of liquid-drop model. Shell model(qualitative).

UNIT-II **06 hrs**

Nuclear Reactions: Types of nuclear reactions with examples. Energy balance in nuclear reactions and the Q-value. Brief discussions on compound nucleus formation in nuclear reactions.

Nuclear fission and fusion: Estimation of the fission energy on the basis of the liquid drop model, the four-factor formula, Thermo-nuclear reactions sources of stellar energy.

UNIT-III **06 hrs**

Alpha decay: Gammow's theory of Alpha decay(Without derivation). Derivation of expression for alpha disintegration energy. Range of Alpha particles. Experimental determination of range of alpha particles.

Beta decay: Types of beta decay with examples.The neutrino Theory of Beta decay(qualitative).

Gamma decay: Origin of Gamma rays and brief explanation**.** Mention different types of interaction of gamma radiation with matter.

UNIT-IV **06 hrs**

Detectors and Accelerators: Detectors: Variation of pulse height with applied voltage in gas filled detector. Brief explanation of Ionisation chamber and Proportional counter. Theoretical and experimental studies on Characteristics and dead time of Geiger-Muller counter.

Accelerators: Theory, construction and working of Linear accelerators and Cyclotron.

Reference Books:

- Nuclear Physics (IV ed)- D.C.Tayal-Himalaya Publishing House,1982.
- Fundamentals of Nuclear Spectroscopy- Basswell- Tata McGraw Hill, Newdehli,2004.
- Nuclear physics- I.Kaplan.
- Beiser A, Concepts of Modern Physics, 6th Edn., TMH, New Delhi (2008).

Course Code	Course Title	Course Type	L	T	P	C	Hrs/Week
B21PC5090	Physics Lab – V	**HC**	**0**	**0**	**2**	**2**	**2**

Course Objectives:

1. Impart knowledge about various experiments related to solids and liquids.
2. Facilitate with the concepts of electron charge, specific charge, and thermistor through experiments.
3. Familiarise with the various experiments of digital electronics.
4. Impart knowledge about determination of physical constant through experiments.

Course Outcomes:

After successful completion of this course the students shall be able to:

1. Verify various properties related to solids and liquids through experiments.
2. Analyse the concepts of electron charge, specific charge, and thermistor through experiments.
3. Demonstrate the various experiments in digital electronics.
4. Determination of physical constant through experiments.

Course Content:
Any EIGHT of the following experiments:
1. Millikan's oil drop method to determine electron charge.
2. Determination of specific charge (e/m) of an electron by Thomson's method.
3. Study of hydrogen spectrum - determination of Rydberg constant.
4. Ionisation potential of Xenon/Mercury.
5. Planck's constant using Photo cell /LED.
6. Study of Divergence of Laser Beam using Photo Diode.
7. Characteristics of GM counter and GM tube (dead time).
8. Dielectric constant of a solid.
9. Dielectric constant of a liquid.
10. Determination of Planck's constant using photocell.
11. IV characteristics of a thermistor.
12. Study of logic gates.
13. Verify the NAND and NOR gates as universal logic gates.
14. Verification of the truth tables of TTL gates.

Course Code	Course Title	Course Type	L	T	P	C	Hrs/Week
B21PC5020	**Chemistry-VI**	**2**	**1**	**0**	**3**	**4**	**4**

UNIT –I: **12 Hours**

Organometallic Compounds

Definition and Classification with appropriate examples based on nature of metal-carbon bond (ionic, s, p and multicenter bonds). Structures of methyl lithium, Zeiss salt and ferrocene. EAN rule as applied to carbonyls. Preparation, structure, bonding and properties of mononuclear and polynuclear carbonyls of 3d metals. p-acceptor behavior of carbon monoxide. Synergic effects (VB approach)- (MO diagram of CO can be referred to for synergic effect to IR frequencies).

UNIT –II: **12 Hours**

Bio-Inorganic Chemistry

A brief introduction to bio-inorganic chemistry. Role of metal ions present in biological systems with special reference to Na^+, K^+ and Mg^{2+} ions: Na/K pump; Role of Mg^{2+} ions in energy production and chlorophyll. Role of Ca^{2+} in blood clotting, stabilization of protein structures and structural role (bones).

Biological oxidation

Bioenergetics; energy transformations in living systems, free energy concept. Exergonic and endergonic reactions, ATP and other high energy compounds. Mitochondrial electron transport chain –components, schematic representation indicating sites of ATP synthesis. Oxidative phosphorylation – Chemosmatic theory (an outline).

UNIT –III: Carbohydrates **12 Hours**

Definition, classification with examples. Monosaccharides: - Structure of fructose. Haworth projection formula of glucose and fructose. Determination of ring size by methylation method (glucose). Definition and mechanism of mutarotation. Interconversion reactions- aldose to ketose (glucose to fructose), ketose to aldose (fructose to glucose), epimerization (mannose to glucose). Disaccharides and polysaccharides: - Structure of sucrose, Haworth projection formula of sucrose partial structure of starch (amylase and amylopectin) and cellulose.

UNIT –IV: Thermodynamics **12 Hours**

Concepts of entropy and free energy: Entropy as measure of randomness and unavailable energy. Entropy changes in reversible and irreversible process and during various processes. Variation of entropy with Temperature and Pressure. Variation of free energy with temperature and pressure. Helmholtz and Gibbs free energies. Gibbs-Helmholtz equation, Thermodynamic criteria of equilibrium and spontaneity. Maxwell's relations, Von't Hoff's reaction isotherm and isochore.

Course Code	Course Title	Course Type	L	T	P	C	Hrs/Week
B21PC5030	Computational Chemistry	**HC**	**2**	**1**	**0**	**3**	**4**

UNIT –I: **12 Hours**

Failures of Classical Mechanics and Introduction to Quantum Mechanics, Schrodinger equation and Postulates of Quantum Mechanics

UNIT –II: **12 Hours**

Exactly Solvable Problems- Particle in a Box, Harmonic Oscillator and Hydrogen Atom, Approximation Method-Perturbation Theory.

UNIT –III: **12 Hours**

Variation Method, Molecules- Born-Oppenheimer Approximation, Introduction to Computational Chemistry-Theory, Computation and Modeling

UNIT –IV: **12 Hours**

Concept of Potential Energy Surface, Hartree Fock Method and Concepts of Functionals, Basis Sets, Applications of Computational Chemistry

V Semester Practicals

1. Isolation of Casein from milk.
2. Separation of ortho and para nitroaniline in a mixture by thin layer chromatography (Demo only)
3. Separation of ortho and para nitroaniline in a mixture by column chromatography. (Demo only)
4. Estimation of vitamin-C by iodometric method.
5. Estimation of amino acid by titrimetric method.
6. Estimation of amino group by acetylation method.
7. Estimation of carboxylic acid by titrimetric method.
8. Estimation of glucose by DNS method.
9. Determination of saponification value of oil.
10. Determination of iodine value of oil.

Course Code	Course Title	Course Type	L	T	P	C	Hrs/Week
B21PC5061	Hetero Cyclic Chemistry & Chemistry of Natural Products	**SC**	**2**	**0**	**0**	**2**	**2**

UNIT –I: **12 Hours**

Heterocyclic Compounds: Introduction to heterocyclic compounds, Types, Nomenclature, Preparation and Properties of the following compounds with reference to electrophilic and nucleophilic substitution with examples, synthesis of furan, thiophene, pyrrole, pyridine, indole (Fischer method) quinoline (Skrup's synthesis with mechanism), isoquinoline, pyrimidine (one method each), aromaticity and basicity of pyrrole and pyridine. Electrophillic substitution reactions of pyrrole and pyridine.

UNIT –II: **12 Hours**

Amino acids and nucleic acids:-

Amino acids: - Introduction, Gabriel Pthalimide synthesis, Zwitter ion, isoelectric point. Peptides: – Synthesis of peptides by carbobenzoxy method. Proteins: – Definition and classification of proteins based on molecular shape (fibrous and globular), denaturation. Nucleic acids: – Introduction, types, nucleosides, nucleotides. Structure and functions of DNA.

Alkaloids: - Introduction, general properties. Synthesis and structural elucidation of nicotine Structural formulae and their physiological importance of quinine, atropine, morphine and cocaine.

Terpenes: - Introduction, definition, classification, isoprene rule. Synthesis and structural elucidation of citral. Structural formulae and biological importance of α-terpeneol and menthol.

Course Code	Course Title	Course Type	L	T	P	C	Hrs/Week
B21PC5040	**Mathematics-VI**	**HC**	**2**	**1**	**0**	**3**	**4**

Course Objectives: To study the concept of sequences, infinite series, rings and fields numerical analysis.

Course Outcomes:

After the completion of the course, students are able to understand the,

- The sequence of real numbers, bounded and unbounded sequences.
- Infinite series, geometric series and various tests.
- Integral domains, division rings and prime elements.
- The concept of Numerical analysis.

UNIT I: Sequences (12 hrs)

Sequence of real numbers – Bounded and unbounded sequences – Infimum and supremum of a sequence – Limit of a sequence – Sum, product and quotient of limits – Standard theorems on limits – Convergent, divergent and oscillatory sequences – Standard properties – Cauchy's general principle of convergence.

UNIT II: Infinite Series (12 hrs)

Infinite series of real numbers – Convergence and Divergence - Oscillation of series – Properties of convergence – Series of positive terms – Geometric series – p – series – Comparison tests – D'Alembert's ratio test – Raabe's test – Cauchy's root test – Leibnitz's test for alternating series. Summation of Binomial.

UNIT III: Rings and Fields (12 hrs)

Rings – Examples – Integral Domains – Division rings – Fields – Subrings. Subfields – Characteristic of a ring – Ordered integral domain – Imbedding of a ring into another ring – The field of quotients – Ideals – Algebra of Ideals – Principal ideal ring – Divisibility in an integral domain – Units and Associates – Prime elements

Unit IV:Numerical Analysis (12 hrs)

Numerical solutions of Algebraic and transcendental equations – Bisection method – The method of false position – Newton – Raphson method . Numerical solutions of first order linear differential equations – Euler – Cauchy method – Euler's modified method – Runge -Kutta fourth order method – Picard's method.

Books for References:

1. S.C Malik –Real Analysis
2. S.C.Malik and Savita Arora, Mathematical Analysis, 2nd ed. New Delhi, India: New Age international (P) Ltd., 1992
3. Richard R Goldberg, Methods of Real Analysis, Indian ed.
4. Asha Rani Singhal and M .K Singhal, A first course in Real Analysis

5. I. N. Herstien – Topics in Algebra.
6. G. D. Birkhoff and S Maclane – A brief Survey of Modern Algebra
7. B. D Gupta – Numerical Analysis
8. H. C Saxena – Finite Difference and Numerical Analysis
9. S. S. Shastry- Introductory Methods of Numerical Analysis

Course Code	Course Title	Course Type	L	T	P	C	Hrs/Week
B21PC5071	**Complex Analysis**	**SC**	**2**	**0**	**0**	**2**	**2**

Course Objectives:
To study the concept of complex analysis, complex variables, linear transformation, vector spaces – basics and dimension.

Course Outcomes:
After the completion of the course, students are able to understand the,

- The concept of vector spaces, criteria for subset and linear combination and span.
- Theorems regarding linear dependence and independence.
- Concept of linear transformation.
- Concept of complex variables

UNIT I: Vector Spaces (6 hrs)
Vector Spaces – Definition – Examples – Vector subspaces – Criterion for a subset to be a subspace – Algebra of Subspaces – Linear Combination – Linear Span.

UNIT II: Basic and Dimension of vector Space(6hrs)
Theorems on linear dependence and linear independence – Basis of a vector space – Dimension of a vector space — Some properties – Quotient spaces .

UNIT III: Linear Transformations (6hrs)
Linear transformation – Kernel and image of a linear transformation – Rank and nullity theorem – Eigen values and Eigen vectors of a linear transformation.

Unit IV: Functions of a Complex Variable (6 hrs)
Analytic functions –Necessary and sufficient condition for function to be analytic – Harmonic functions – Real and Imaginary parts of an analytic function are harmonic – Construction of analytic function Milne Thomson Method.

Books for References:
1. I. N. Herstien – Topics in Algebra.
2. Stewart – Introduction to Linear Algebra
3. T. K. Manicavasagam Pillai and K S Narayanan – Modern Algebra Volume 2
4. S. Kumaresan – Linear Algebra
5. G. D. Birkhoff and S Maclane – A brief Survey of Modern Algebra.
6. Gopalakrishna – University Algebra
7. Saymour Lipschitz – Theory and Problems of Linear Algebra.
8. L. V. Ahlfors – Complex Analysis

9. Bruce P. Palka – Introduction to the Theory of Function of a Complex Variable
10. Serge Lang – Complex Analysis
11. Shanthinarayan – Theory of Functions of a Complex Variable
12. S. Ponnuswamy – Foundations of Complex Analysis
13. R. P. Boas – Invitation to Complex Analysis.

Course Code	Course Title	Course Type	L	T	P	C	Hrs/Week
B21PC5072	**Fluid Dynamics**	**SC**	**2**	**0**	**0**	**2**	**2**

Course Objective: To study the concept of Fluid mechanics which deals with mechanics of fluids (liquids and gases). Fluid mechanics has a wide range of applications, including mechanical engineering, civil engineering, chemical engineering, geophysics, astrophysics, and biology.

Course Outcome: after the completion of the course students can be able to understand.

- The basic concepts and equations including kinematics of fluid in motion, equation of continuity, general analysis of fluid motion, equation of motion and energy equations.
- The concept of fluid dynamics of real or viscous fluids.
- About law of viscosity, states of stress and rate of strain and relation between them, Navier-Stoke's
- About equations of motion, vorticity equations, laminar flows problems and problems associated with steady flow in pipes.

Unit – I 6hrs

Two–dimensional inviscid incompressible flows: Stream function, Irrotational motion in two and three dimensions. Image system of a source, sink and doublet. Complex velocity potential. Thomson-circle theorem. Two- dimensional irrotational motion produced by motion of circular cylinder.

Unit –II 6hrs

Two dimensional motion produced by the motion of cylinder of arbitrary uniform cross section in an infinite mass of liquid at rest at infinity. Motion due to elliptic cylinder in an infinite mass of liquid. Kinetic energy of liquid contained in rotating elliptic cylinder.

Unit – III 6hrs

Three–dimensional motion: Motion of a sphere through a liquid at rest at infinity. Liquid streaming past a fixed sphere. Equation of motion a sphere. D'Alembert's paradox, impulsive motion, initial motion of liquid contained in the intervening space between two concentric spheres.

Unit IV- 6hrs

Kelvin's proof of permanence. Motions due to circular and rectilinear vortices. Infinite rowes of line vortices. Dynamical similarity. Buckingham pi-theorem, Reynolds number. Prandtl's boundary layer, boundary layer equations in two dimensions.

Reference Books :

1. W.H. Besant and A.S. Ramsey, A Treatise on Hydromechanics, Part-II, CBS Publishers, Delhi, 1988.
2. F. Chorlton, Text-book of Fluid Dynamics, C.B.S. Publishers, Delhi, 1985.
3. Michael E.O. Neill and F. Chorlton, Ideal and Incompressible Fluid Dynamics, John Wiley & Sons, 1986. 4. S. W. Yuan, Foundations of Fluid Mechanics, Prentice Hall of India Ltd., New Delhi,

1976.event
4. G.K. Batchelor, An Introduction to Fluid Mechanics, Foundation Books, New Delhi, 1994.
5. A.J. Chorin and A. Marsden, A Mathematical Introduction to Fluid Dynamics Springer-Verlag, New York, 1993.
6. L.D. Landau and E.M. Lipschitz, Fluid Mechanics Pergamon Press, London, 1985.
7. H. Schlichting, Boundary Layer Theory, McGraw Hill Book Company, New York, 1979. 64
8. R.K. Rathy. An Introduction to Fluid Dynamics, Oxford and IBH Publishing Company, New Delhi. 1976.
9. A.D. Young, Boundary Layers, AIAA Education Series, Washington DC, 1989.

Course Code	Course Title	Course Type	L	T	P	C	Hrs/Week
B21PC5073	**Number Theory**	**SC**	**2**	**0**	**0**	**2**	**2**

Course Objective:
To study the concept of basic theory of prime numbers, the theory of congruence, Fermat's last theorem, to acquire knowledge in cryptography specially in RSA encryption and decryption.

Course Outcome:
Upon successful completion of this course students will able to understand the basic definitions and theorems in number theory, to identify order of an integer, primitive roots, Euler's criterion, the Legendre symbol, Jacobi symbol and their properties, to understand modular arithmetic number-theoretic functions and apply them to cryptography.

UNIT I **6 hrs**
Linear Diophantine equation, prime counting function, statement of prime number theorem, Goldbach conjecture, linear congruences, complete set of residues, Chinese remainder theorem, Fermat's little theorem, Wilson's theorem.

UNIT II **6 hrs**
Number theoretic functions, sum and number of divisors, totally multiplicative -1. functions, definition and properties of the Dirichlet product, the Mobius inversion formula, the greatest integer function, Euler's phi-function, Euler's theorem, reduced set of residues, some properties of Euler's phi-function.

UNIT III **6 hrs**
Order of an integer modulo n, primitive roots for primes, composite numbers having primitive roots, Euler's criterion, the Legendre symbol, Jacobi symbol and their properties, quadratic reciprocity, quadratic congruences with composite moduli.

UNIT IV **6 hrs**
Affine ciphers, Hill ciphers, p ublickey cryptography, RSA encryption and decryption, the equation $ + %$ = '$,Fermat's Last Theorem.

References:

1. David M.Burton, Elementary Number Theory (6thEdition), TataMcGraw-Hill Edition, Indian reprint, 2007.
2. Thomas Koshy, ElementaryNumber Theory with Applications (2 nd Edition), Academic Press, 2007.
3. Neville Robinns, Beginning Number Theory (2ndEdition), Narosa Publishing House Pvt.Limited, Delhi,2007.

Course Code	Course Title	Course Type	L	T	P	C	Hrs/Week
B21PC5X20	**Mathematics Lab-V**	**HC**	**2**	**1**	**0**	**3**	**4**

Course Objectives: To study the concept of sequences, infinite series, rings and fields numerical analysis.

Course Outcomes:

After the completion of the course, students are able to understand the concepts of Cauchy's criterion, find the root of the algebraic and the transcendental equations, To test the convergence of the series, concept of Field/Integral Domain and solve the first order differential equation using fourth order using Runge-Kutta method.

List of Experiments:

1. To test the convergence of the sequence.
2. To test the convergence of the sequence using Cauchy's criterion.
3. To find the root of the algebraic and the transcendental equations using Bisection method.
4. To find the root of the algebraic and the transcendental equations using Regula-Falsi method.
5. To test the convergence of the series.
6. To test the convergence of the series by D' Alembertr's ratio test and Raabe's test.
7. To find the sum of the series.
8. i) To verify the given Ring is Commutative or not.
   ii) To check the presence of the unity element in the ring.
9. i) To verify the given Ring is a Field/Integral Domain or not.
   ii) To verify given set is a subring of a ring or not.
10. i) To find the Units of the given ring.
    ii) To verify the given elements are associate or not.
11. To solve the first order differential equation using fourth order using Runge-Kutta method.