RAFFLES UNIVERSITY

SCHOOL OF BASIC AND APPLIED SCIENCES
Department of Physics
(Syllabus and Scheme of Studies w. e. f. 2016-17 onwards)
B.Sc. (PCM) II Year (III Semester)

Lectures : 2 Hrs
Examination Time : 3 Hrs **Maximum Marks: 50(20+30)**
Subject : Electrostatics **Paper Code : PHY-201**

Note: *Examiner will set nine questions and the students will be required to attempt five questions in all, Question number one is compulsory containing six short answer types' questions covering the entire syllabus and will be of 1 mark. Further examiner will be set two questions from each unit and the students will be required to attempt one question from each unit which will be of 6 marks each.*

UNIT-I

Coulomb's law of electrostatics, intensity and potential; Gauss' theorem – its application; Poisson and Laplace's equations; deduction from Gauss's theorem; Uniqueness theorem. Superposition theorem (statement only). Application of Laplace's equation to simple cases of symmetric spherical charge distribution.

UNIT –II

Multipole expansion of scalar potential – monopole, dipole and quadrupole terms; potential and field due to a dipole; work done in deflecting a dipole; dipole-dipole interaction(for both electric and magnetic dipoles); force on dipole in a non- homogeneous field.

UNIT -III

Polarisation, electric displacement vector (D); Gauss's theorem in dielectric media; boundary conditions; electrostatic field energy; computation of capacitance in simple cases (parallel plates); spherical and cylindrical capacitors containing dielectrics – uniform and non uniform.

UNIT –IV

Solution of field problems in case of a point charge near a grounded conducting infinite plane. Boundary value problem : in uniform external field for (i) conducting spherical shell and (ii) dielectric sphere.

Books Recommended:

1. Introduction to Electrodynamics by A.Z.Capri & P.V.Panat.(New Delhi: Narosa Pub.House, 2002).
2. Electromagnetics by Joseph A.Edminister 2nd ed.(New Delhi: Tata Mc Graw Hill, 2006).
3. Fundamentals of electromagnetics by M.A.W.Miah.(Tata Mc Graw Hill,1992)
4. Applied electromagnetism By Liang Chi Shen, Jin Au Kong (PWS Pub. Co., 1995)
5. David J. Griffiths, Introduction to Electrodynamics, 3rd edition, (Benjamin Cummings 1998).

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Department of Physics
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B.Sc. (PCM) II Year (III Semester)

Lectures : 2 Hrs
Examination Time : 3 Hrs **Maximum Marks: 50(20+30)**
Subject : Magnetism **Paper Code : PHY-203**

Note: *Examiner will set nine questions and the students will be required to attempt five questions in all, Question number one is compulsory containing six short answer types' questions covering the entire syllabus and will be of 1 mark. Further examiner will be set two questions from each unit and the students will be required to attempt one question from each unit which will be of 6 marks each.*

UNIT-I

Lorentz force and concept of magnetic induction; force on linear current element; Biot- Savart's law. Ñ. B = 0; magnetic vector potential; calculation of vector potential and magnetic induction in simple cases – straight wire, magnetic field due to small current loop.

UNIT –II

magnetic dipole; field due to a dipole; magnetic shell; Ampere's theorem; Ampere's circuital law illustration (straight wire); force between long parallel current carrying conductors Magnetic mono pole and dipole; comparison between static electric and magnetic fields.

UNIT -III

Free current and bound current; surface and volume density of current distribution; magnetization; non uniform magnetization of matter ; Ampere's law in terms of free current density and introduction of H.

UNIT –IV

line integral of H in terms of free current; boundary conditions for B and H; permanently magnetized body; magnetic scalar potential; application of Laplace's equation to the problem of a magnetic sphere in uniform magnetic field; hysteresis and energy loss in ferromagnetic material; magnetic circuit; energy stored in magnetic field.

Books Recommended:

1. Fundamentals of electromagnetics by M.A.W.Miah.(Tata Mc Graw Hill,1992)
2. Applied electromagnetism By Liang Chi Shen, Jin Au Kong (PWS Pub. Co., 1995)
3. David J. Griffiths, Introduction to Electrodynamics, 3rd edition, (Benjamin Cummings 1998).
4. J. D. Jackson, Classical Electrodynamics, 3rd edition, (Wiley, New York 1998)
5. M. Lifshitz and L. D. Landau, Classical Theory of Fields (Course of Theoretical Physics), 2nd Edition, (Pergamon Pr; 1981).

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Lectures : 2 Hrs
Examination Time : 3 Hrs **Maximum Marks: 50(20+30)**
Subject : Elective paper **Paper Code : PHY-205(A)**

Note: *Examiner will set nine questions and the students will be required to attempt five questions in all, Question number one is compulsory containing six short answer types' questions covering the entire syllabus and will be of 1 mark. Further examiner will be set two questions from each unit and the students will be required to attempt one question from each unit which will be of 6 marks each.*

OPTICS – I

UNIT-I

Light as electromagnetic waves wave normals and rays : short wavelength limit and ray(geometrical) optics. Fermat principle, application to reflection and refraction at curved surfaces. Dispersive power of optical systems, dispersive power of prism.

UNIT –II

Chromatic aberration – methods of reduction, achromatic lens combination. Optical instruments Field of view, entrance and exit pupil microscope, eyepieces- Ramsden and Huygen. Huygen's principle; deduction of law of reflection and refraction.

UNIT -III

Fresnel's biprism, interference in thin film; fringes of equal inclination and equal thickness;Newton's ring. Michelson's interferometer, application in fine structure study. Multiple beam interference – reflected and transmitted pattern. Fabry-Perot interferometer and application to fine structure study.

UNIT –IV

Fresnel and Fraunhofer class, Fresnel's half period zones; explanation of rectilinear propagation of light; zone plate. Fraunhofer diffraction due to a single slit, double slit and circular aperature (qualitative). Plane diffraction grating (transmission). Rayleigh criterion of resolution; resolving power of prism, telescope, microscope and transmission grating.

Books Recommended:

1. Optics and Atomic Physics – B. P. Khandelwal (Siblal Agarwala).
2. Optical Electronic – A. K. Ghatak and K. Tyagrajan.
3. Introduction to Fibre Optics - R. A. Shotwell (EEE, Prentice Hall).

OR

Paper Code : PHY-205(B)

Material Sciences

UNIT-I

Atomic structure and bonding in materials. Crystal structure of materials, crystalsystems, unit cells and space lattices, determination of structures of simple crystals byx-ray diffraction, miller indices of planes and directions, packing geometry in metallic,ionic and covalent solids. Concept of amorphous, single and polycrystalline structuresand their effect on properties of materials. Crystal growth techniques. Imperfections incrystalline solids and their role in influencing various properties.

UNIT –II

Imperfections in crystalline solids and their role in influencing various properties. Smart materials, exhibiting ferroelectric, piezoelectric, optoelectric, semiconducting behavior, lasers and optical fibers, photoconductivity and superconductivity,nanomaterials.

UNIT -III

Stress-strain diagrams of metallic, ceramic and polymeric materials, modulus of elasticity, yield strength, tensile strength, toughness, elongation, plastic deformation, viscoelasticity, hardness, impact strength, creep, fatigue, ductile and brittle fracture.

UNIT –IV

Reflection, refraction, absorption and transmission of electromagnetic radiation in solids. Origin of magnetism in metallic and ceramic materials, paramagnetism, diamagnetism, antiferro magnetism, ferromagnetism, ferrimagnetism, magnetic hysterisis.

Books Recommended:

1. Material Science by V.Raghwan
2. Material science by Dierk Raabe
3. Material Science by kelester

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Schedule per Week Practical : 4 Hrs

Examination Time : 4 Hrs **Maximum Marks: 50(20+30)**

Subject : Physics Lab-III **Paper Code : PHY-207**

List of Experiments

Note: Students are required to perform minimum five experiments from given list.

1. To determine Earth's magnetic field using tangent Galvanometer.
2. Viscosity of water by its flow through a uniform capillary tube.
3. Verify the Faraday Law using magnetic induction.
4. Conversion of galvanometer into ammeter.
5. Conversion of galvanometer into voltmeter.
6. Calibration of a thermocouple by Potentiometer.

To determine specific resistance of a metallic wire using potentiometer.

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B.Sc. (PCM) II Year (III Semester)

Schedule per week Lectures: 2
Examination Time : 3 Hrs **Maximum Marks: 50(20+30)**
Subject : Inorganic Chemistry **Paper Code : CH-201**

Note: *Examiner will set nine questions and the students will be required to attempt five questions in all, Question number one is compulsory containing six short answer types questions covering the entire syllabus and will be of 1 marks. Further examiner will be set two questions from each unit and the students will be required to attempt one question from each unit which will be of 6 marks each.*

UNIT–I

Chemistry of Elements of I transition series: Definition of transition elements, position in the periodic table, General characteristics & properites of I transition elements, Structures & properties of some compounds of transition elements-TiO_2, $VOCl_2$, $FeCl_3$, $CuCl_2$ and Ni $(CO)_4$

UNIT-II

Chemistry of Elements of IInd & IIIrd transition series: General characteristics and properties of the IInd and IIIrd transition elements Comparison of properties of 3d elements with 4d & 5d elements with reference only to ionic radii, oxidation state, magnetic and Spectral properties and stereochemistry

UNIT-III

Coordination Compounds: Werner's coordination theory, effective atomic number concept, chelates, nomenclature of coordination compounds, isomerism in coordination compounds, valence bond theory of transition metal complexes

UNIT-IV

Non-aqueous Solvents: Physical properties of a solvent, types of solvents and their general characteristics, reactions in non-aqueous solvents with reference to liquid NH_3 and liquid SO_2

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Schedule per week Lectures: 2
Examination Time : 3 Hrs **Maximum Marks: 50(20+30)**
Subject : Organic Chemistry **Paper Code : CH-203**

Note: *Examiner will set nine questions and the students will be required to attempt five questions in all, Question number one is compulsory containing six short answer types questions covering the entire syllabus and will be of 1 marks. Further examiner will be set two questions from each unit and the students will be required to attempt one question from each unit which will be of 6 marks each.*

UNIT–I

Alcohols: Monohydric alcohols nomenclature, methods of formation by reduction of aldehydes, ketones, carboxylic acids and esters. Hydrogen bonding. Acidic nature. Reactions of alcohols. Dihydric alcohols — nomenclature, methods of formation, chemical reactions of vicinal glycols, oxidative cleavage [$Pb(OAc)_4$ and HIO_4] and pinacol-pinacolone rearrangement.

Epoxides: Synthesis of epoxides. Acid and base-catalyzed ring opening of epoxides, orientation of epoxide ring opening, reactions of Grignard and organolithium reagents with epoxides

UNIT-II

Phenols: Nomenclature, structure and bonding. Preparation of phenols, physical properties and acidic character. Comparative acidic strengths of alcohols and phenols, resonance stabilization of phenoxide ion. Reactions of phenols — electrophilic aromatic substitution, Mechanisms of Fries rearrangement, Claisen rearrangement, Reimer-Tiemann reaction, Kolbe's reaction and Schotten and Baumann reactions.

UNIT-III

Ultraviolet (UV) absorption spectroscopy: Absorption laws (Beer-Lambert law), molar absorptivity, presentation and analysis of UV spectra, types of electronic transitions, effect of conjugation. Concept of chromophore and auxochrome. Bathochromic, hypsochromic, hyperchromic and hypochromic shifts. UV spectra of conjugated enes and enones,Woodward-Fieser rules, calculation of□max of simple conjugated dienes and -unsaturated ketones. Applications of UV Spectroscopy in structure elucidation of simple organic compounds.

UNIT-IV

Carboxylic Acids & Acid Derivatives: Nomenclatu re of Carboxylic acids, structure and bonding, physical properties, acidity of carboxylic acids, effects of substituents on acid strength. Preparation of carboxylic acids. Reactions of carboxylic acids. Hell-Volhard Zelinsky reaction. Reduction of carboxylic acids. Mechanism of decarboxylation. Structure, nomenclature and preparation of acid chlorides, esters, amides and acid anhydrides. Relative stability of acyl derivatives.Physical properties, interconversion of acid derivatives by nucleophilic acyl substitution. Mechanisms of esterification and hydrolysis (acidic and basic)

OR

Schedule per week Lectures: 2

Examination Time : 3 Hrs **Maximum Marks: 50(20+30)**

Subject : Polymer Chemistry (Elective) **Paper Code : CH-203**

UNIT-I

Introduction and history of polymeric materials: Different schemes of classification of polymers, Polymer nomenclature, Molecular forces and chemical bonding in polymers, Texture of Polymers.

Functionality and its importance: Criteria for synthetic polymer formation, classification of polymerization processes, Relationships between functionality, extent of reaction and degree of polymerization. Bifunctional systems, Poly-functional systems.

UNIT-II

Kinetics of Polymerization: Mechanism and kinetics of step growth, radical chain growth, ionic chain (both cationic and anionic) and coordination polymerizations, Mechanism and kinetics of copolymerization, polymerization techniques. **Crystallization and crystallinity:** Determination of crystalline melting point and degree of crystallinity, Morphology of crystalline polymers, Factors affecting crystalline melting point.

Nature and structure of polymers-Structure, Property relationships.

UNIT-III

Determination of molecular weight of polymers (Mn, Mw, etc) by end group analysis, viscometry, light scattering and osmotic pressure methods. Molecular weight distribution and its significance. Polydispersity index.

Glass transition temperature (Tg) and determination of Tg, Free volume theory, WLF equation, Factors affecting glass transition temperature (Tg).

UNIT-IV

Polymer Solution – Criteria for polymer solubility, Solubility parameter, Thermodynamics of polymer solutions, entropy, enthalpy, and free energy change of mixing of polymers solutions, Flory- Huggins theory, Lower and Upper critical solution temperatures.

Properties of Polymers (Physical, thermal, Flow & Mechanical Properties). Brief introduction to preparation, structure, properties and application of the following polymers: polyolefins, polystyrene and styrene copolymers, poly(vinyl chloride) and related polymers, poly(vinyl acetate) and related polymers, acrylic polymers, fluoro polymers, polyamides and related polymers. Phenol formaldehyde resins (Bakelite, Novalac), polyurethanes, silicone polymers, polydienes, Polycarbonates, Conducting Polymers, [polyacetylene, polyaniline, poly(p-phenylene sulphide polypyrrole, polythiophene)].

Reference Books:

1. Seymour's Polymer Chemistry, Marcel Dekker, Inc.
2. G. Odian: Principles of Polymerization, John Wiley.
3. F.W. Billmeyer: Text Book of Polymer Science, John Wiley.
4. P. Ghosh: Polymer Science& Technology, Tata Mcgraw-Hill.
5. R.W. Lenz: Organic Chemistry of Synthetic High Polymers.

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B.Sc. (PCM) II Year (III Semester)

Schedule per week Lectures: 2

Examination Time	**: 3 Hrs**	**Maximum Marks: 50(20+30)**
Subject	**: Physical Chemistry**	**Paper Code : CH-205**

Note: *Examiner will set nine questions and the students will be required to attempt five questions in all, Question number one is compulsory containing six short answer types questions covering the entire syllabus and will be of 1 marks. Further examiner will be set two questions from each unit and the students will be required to attempt one question from each unit which will be of 6 marks each*

UNIT-I

Thermodynamics-I: Definition of thermodynamic terms: system, surrounding etc. Types of systems, intensive and extensive properties. State and path functions and their differentials. Thermodynamic process. Concept of heat and work. Zeroth Law of thermodynamics, First law of thermodynamics: statement, definition of internal energy and enthalpy. Heat capacity, heat capacities at constant volume and pressure and their relationship.

UNIT-II

Thermodynamics-II: Joule's law, Joule Thomson coefficient for ideal gas and real gas: and inversion temperature. Calculation of w q dU & dH for the expansion of ideal gases under isothermal and adiabatic conditions for reversible process, Temperature dependence of enthalpy, Kirchoffs equation. Bond energies and applications o f bond energies.

UNIT-III

Chemical Equilibrium: Equilibrium constant and free energy, concept of chemical potential, Thermodynamic derivation of law of chemical equilibrium. Temperature dependence of equilibrium constant; Van't Hoff reaction isochore, Van't Hoff reaction isotherm. Le-Chatetier's principle and its applications Clapeyron equation and Clausius-Clapeyron equation its applications.

UNIT-IV

Distribution Law: Nernst distribution law – its thermodynamic derivation, Modification of distribution law when solute undergoes dissociation, association and chemical combination. Applications of distribution law: (i) Determination of degree of hydrolysis and hydrolysis constant of aniline hydrochloride. (ii) Determination of equilibrium constant of potassium triiodide complex and process of extraction.

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B.Sc. (PCM) II Year (III Semester)

Schedule per week Practical: 6
Examination Time : 4 Hrs **Maximum Marks: 50 (20+30)**
Subject : Chemistry Lab-III **Paper Code : CH-207**

UNIT-I (Inorganic)

1**. Gravimetric Analysis**
Quantitative estimations of, Cu^{2+} as copper thiocyanate and Ni^{2+} as Ni – dimethylglyoxime.

2**. Colorimetry:**
To verify Beer - Lambert law for $KMnO_4/K_2Cr_2O_7$ and determine the concentration of the given $KMnO_4/K_2Cr_2O_7$ solution.

UNIT-II (Physical)

1. To determine the CST of phenol – water system.
2. To determine the solubility of benzoic acid at various temperatures and to determine the H of the dissolution process.

UNIT-III (Organic)

Laboratory Techniques

(a) Steam distillation (non evaluative) Naphthalene from its suspension in water
Separation of *o*-and *p*-nitrophenols

(b) Column chromatography (non evaluative) Separation of fluorescein and methylene blue
Separation of leaf pigments from spinach leaves

Distribution of marks

1. UNIT-I	10 (6+4) marks
2. UNIT-II	10 (6+4) marks
3. UNIT-III	10 (6+4) marks
4. Viva-voce	10 (6+4) marks
5. Lab Record	10 (6+4) marks

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SCHOOL OF BASIC AND APPLIED SCIENCE
Department of Mathematics
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B.Sc. (PCM) II Year (III Semester)

Lectures : 2 Hrs
Examination Time : 3 Hrs **Maximum Marks: 50(20+30)**
Paper Title : Advanced Calculus **Paper Code : MA-201**

Note: *Examiner will set nine questions and the students will be required to attempt five questions in all, Question number one is compulsory containing six short answer types' questions covering the entire syllabus and will be of 1 mark. Further examiner will be set two questions from each unit and the students will be required to attempt one question from each unit which will be of 6 marks each*

UNIT-I

Continuity, Sequential Continuity, properties of continuous functions, Uniform continuity. Mean value theorems; Rolle's Theorem and Lagrange's mean value theorem and their geometrical interpretations. Taylor's Theorem with various forms of remainders, Darboux intermediate value theorem for derivatives.

UNIT-II

Limit and continuity of real valued functions of two variables. Taylor's theorem for functions of two variables. Maxima, Minima and saddle points of two variables. Lagrange's method of multipliers and Envelopes.

UNIT-III

Reduction formula, Beta and Gamma function.

UNIT-IV

Qudrature, Rectification, Volume and surface of solids of revolution, Pappus theorem, double and triple integrals, Change the order of integration, Dirichlet's integral.

Books Recommended:

1. C.E. Weather burn: Differential Geometry of three dimensions, Radhe Publishing House, Calcutta
2. Gabriel Klaumber : Mathematical analysis, Mrcel Dekkar, Inc., New York, 1975
3. R.R. Goldberg : Real Analysis, Oxford & I.B.H. Publishing Co., New Delhi, 1970
4. Gorakh Prasad : Differential Calculus, Pothishala Pvt. Ltd., Allahabad
5. S.C. Malik : Mathematical Analysis, Wiley Eastern Ltd., Allahabad.
6. Shanti Narayan : A Course in Mathemtical Analysis, S.Chand and company, New Delhi
7. Murray, R. Spiegel : Theory and Problems of Advanced Calculus, Schaum Publishing co., New York
8. A. R. Vasishtha, J.N. Sharma, A. K. Vasishtha Advanced Calculus Krishna Prakashan Media

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B.Sc. (PCM) II Year (III Semester)

Lectures : 2 Hrs
Examination Time : 3 Hrs **Maximum Marks: 50(20+30)**
Paper Title : Partial Differential Equations **Paper Code : MA-203**

Note: *Examiner will set nine questions and the students will be required to attempt five questions in all, Question number one is compulsory containing six short answer types' questions covering the entire syllabus and will be of 1 mark. Further examiner will be set two questions from each unit and the students will be required to attempt one question from each unit which will be of 6 marks each*

UNIT-I

Partial differential equations: Formation, order and degree, Linear and Non-Linear Partial differential equations of the first order: Complete solution, singular solution, General solution, Solution of Lagrange's linear equations, Charpit's general method of solution. Compatible systems of first order equations, Jacobi's method.

UNIT-II

Linear partial differential equations of second and higher orders, Linear and non-linear homogeneous and non-homogeneous equations with constant co-efficient, Partial differential equation with variable co-efficient reducible to equations with constant coefficients, their complimentary functions and particular Integrals, Equations reducible to linear equations with constant co-efficients.

UNIT-III

Classification of linear partial differential equations of second order, Hyperbolic, parabolic and elliptic types, Reduction of second order linear partial differential equations to Canonical (Normal) forms and their solutions, Solution of linear hyperbolic equations, Monge's method for partial differential equations of second order.

UNIT-IV

Method of separation of variables: Solution of Laplace's equation, Wave equation (one and two dimensions), Diffusion (Heat) equation (one and two dimension) in Cartesian Co-ordinate system.

Books Recommended:

1. D.A.Murray: Introductory Course on Differential Equations, Orient Longman, (India),1967
2. Erwin Kreyszing : Advanced Engineering Mathematics, John Wiley & Sons, Inc., New York, 1999
3. A.R. Forsyth : A Treatise on Differential Equations, Macmillan and Co. Ltd.
4. Ian N.Sneddon : Elements of Partial Differential Equations, McGraw Hill BookCompany, 1988
5. Frank Ayres : Theory and Problems of Differential Equations, McGraw Hill BookCompany, 1972
6. J.N. Sharma & Kehar Singh : Partial Differential Equations

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Lectures : 2 Hrs
Examination Time : 3 Hrs **Maximum Marks: 50(20+30)**
Paper Title : Elective paper **Paper Code : MA-205(A)**

Statics

Note: *Examiner will set nine questions and the students will be required to attempt five questions in all, Question number one is compulsory containing six short answer types' questions covering the entire syllabus and will be of 1 mark. Further examiner will be set two questions from each unit and the students will be required to attempt one question from each unit which will be of 6 marks each*

UNIT-I

Forces acting at a point, Parallel forces. Moments and Couples.

UNIT-II

Analytical conditions of equilibrium of coplanar forces. Friction. Centre of Gravity.

UNIT-III

Virtual work. Forces in three dimensions. Poinsots central axis.

UNIT-IV

Wrenches. Null lines and planes. Stable and unstable equilibrium.

Books Recommended:

1. S.L. Loney : Statics, Macmillan Company, London
2. R.S. Verma : A Text Book on Statics, Pothishala Pvt. Ltd., Allahabad

OR

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Lectures : 2 Hrs
Examination Time : 3 Hrs **Maximum Marks: 50(20+30)**
Paper Title : Elective paper **Paper Code : MA-205(B)**

Number Theory and Cryptography

Note: *Examiner will set nine questions and the students will be required to attempt five questions in all, Question number one is compulsory containing six short answer types' questions covering the entire syllabus and will be of 1 mark. Further examiner will be set two questions from each unit and the students will be required to attempt one question from each unit which will be of 6 marks each*

UNIT- I

Divisibility:- GCD, LCM , Prime number, fundamental theorem of arithmetic, perfect numbers, floor and ceiling functions, Congruence: properties, complete and reduced residue system, Fermat's theorem, Euler functions, Chinese remainder theorem.

UNIT-II

Primality testing and factorization algorithms, Pseudo primes, Fermate's pseudo-primes, Pollard's rho method for factorization.

UNIT-III

Introduction to cryptography: Attack services and mechanisms, Security services, Conventional encryption. Classical techniques: Model stegnanography, Clasical encryption technique, Modern techniques: DES, cryptanalysis, block cipher principles and design, key distribution problem, Random number generation.

UNIT-IV

Hash function public key cryptography, Diffie-Hellmann key exchange, Discrete logarithm-based crypto-systems, RSA crypto system signature schemes, Digital signature standard (DSA), RSA signature schemes, knapsack problem.

Books Recommended:

1. **Koblitz**, Neal A Course in Number Theory and Cryptography Publisher Springer
2. J. H. Loxton Number Theory and Cryptography Publisher: Cambridge University Press

Dr.Hari Kishan, Dr. Manoj Km. Baliyan Number Theory and Cryptography publisher Krishna Pvt. Ltd.

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(Syllabus and Scheme of Studies w. e. f. 2016-17 onwards)
B.Sc. (PCM) II Year (IV Semester)

Lectures : 2 Hrs
Examination Time : 3 Hrs **Maximum Marks: 50(20+30)**
Subject : Statistical Mechanics **Paper Code : PHY-202**

Note: *Examiner will set nine questions and the students will be required to attempt five questions in all, Question number one is compulsory containing six short answer types' questions covering the entire syllabus and will be of 1 mark. Further examiner will be set two questions from each unit and the students will be required to attempt one question from each unit which will be of 6 marks each.*

UNIT-I

Statistical Mechanics: microstates and macrostates-classical description in terms of phase space and quantum description in terms of wave functions. Idea of ensemble. Hypothesis of equal a priori probability for microstates of an isolated system in equilibrium.

UNIT –II

Micro-canonical ensemble, Canonical and Grand canonical ensemble. Partition function of a system in thermal equilibrium with heat bath. Law of equipartition of energy, its limit of validity and application.

UNIT -III

Quantum Statistics: Gibbs' Paradox, Identical particle and symmetry requirement. Derivation of FD and BE statistics as the most probable distributions (micro- canonical ensemble). Classical limit of quantum statistics.

UNIT –IV

Bose Einstein (BE) distribution law: Derivation, Application of BE statistics to derive Planck's law. Rayleigh Jean's and Wien's law as limiting cases of Planck's law. Phonons and lattice, specific heat of solids: Einstein and Debye's theory, Bose- Einstein condensation.

Books Recommended:

1. Statistical Physics, F. Mandle (ELBS).
2. Fundamentals of Statistical and Thermal Physics, F. Reif, (Mc Graw Hill).
3. Statistical Mechanics by R. K. Patharia.(Oxford: Butterworth, 1996).
4. Statistical Mechanics by K. Huang (Wiley, 1987.)
5. Statistical Mechanics by eyring eyring eyring

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B.Sc. (PCM) II Year (IV Semester)

Lectures : 2 Hrs
Examination Time : 3 Hrs **Maximum Marks: 50(20+30)**
Subject : Quantum Mechanics-I **Paper Code : PHY-204**

Note: *Examiner will set nine questions and the students will be required to attempt five questions in all, Question number one is compulsory containing six short answer types' questions covering the entire syllabus and will be of 1 mark. Further examiner will be set two questions from each unit and the students will be required to attempt one question from each unit which will be of 6 marks each.*

UNIT-I

Basic Quantum Mechanics: de Broglie hypothesis, Compton effect, Davision-Germer experiment, Heisenberg uncertainty principle. Concept of wave function as describing the dynamical state of a single particle. Group velocity and phase velocities. Classical velocity of a particle and group velocity of the wave representing the particle. Principle of superposition.

UNIT –II

Operators in quantum mechanics: Basic postulates of quantum mechanics, Dynamical variables as linear hermitian operators, eigenvalue equation satisfied by them. Momentum energy and angular momentum operators. Results of measurement of variables. Expectation values

UNIT –III

Commutation relations between the operators. Compatible observables and simultaneous measurements. Ehrenfest theorem. Time dependent and time independent Schrödinger equation. Solutions, Eigen states, normalization and ortho-normality of wave function.

UNIT –IV

Simple application of Quantum Mechanics: One dimensional potential well, boundary condition. Penetration of rectangular potential barrier in one dimension: derivation of reflection and transmission coefficients.-explanation of alpha decay.

Books Recommended:

1. Quantum Mechanics – J. L. Powell and B. Crasemonn, (Oxford, Delhi).
2. Quantum Mechanics – F. Schwabl (Narosa).
3. Quantum Mechanics – A. K. Ghatak and S. Lokenathan (Macmillan, Delhi).

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B.Sc. (PCM) II Year (IV Semester)

Lectures : 2 Hrs
Examination Time : 3 Hrs **Maximum Marks: 50(20+30)**
Subject : Elective paper **Paper Code : PHY-206(A)**

Note: *Examiner will set nine questions and the students will be required to attempt five questions in all, Question number one is compulsory containing six short answer types' questions covering the entire syllabus and will be of 1 mark. Further examiner will be set two questions from each unit and the students will be required to attempt one question from each unit which will be of 6 marks each.*

OPTICS – II

UNIT-I

Polarization : Different states of polarization; double refraction (Explanation from Electromagnetic theory), Huygen's construction for uni axial crystals; Polaroid's and their uses. circularly and elliptically polarized light. Fresnel's explanation of optical activity; Bi quartz and half shade polarimeter.

UNIT –II

Production and analysis of plane, circularly and elliptically polarised light by retardation plates and rotatory polarisation Frenel's diffraction, Zone plate, diffraction due to straight edge. Fraunhoffer diffraction due to single and double slits, plane transmission grating and its resolving power.

UNIT -III

The principle of holography, Modifications and applications. Observing small object deformations . Holographic optical instruments Pattern recognition Volume holograms.

UNIT –IV

The electricdipole interaction ,Simple laser theory. Three-level systems and atomic interference Lasing without inversion ,Correlated emission laser. Motion of a two-level atom in a quantized light field.

Books Recommended:

1. Fundamentals of Optics By Francis Arthur Jenkins and Harvey Elliott White (McGraw-Hill, 1976)
2. Optics by Ajoy Ghatak (Tata McGraw Hill, 2008)
3. Optics By Eugene Hecht and A R Ganesan (Pearson Education, 2002)
4. Light and Optics: Principles and Practices by Abdul Al-Azzawi (CRC Press, 2007)
5. Contemporary Optics by A. K. Ghatak & K. Thyagarajan.(Plenum Press,1978).

OR

Paper Code : PHY-206(B)

Astrophysics & Cosmology

UNIT-I

Ancient astronomical systems and their utility. Celestial sphere. Calendrical phenomena. Major planets, their orbits and their satellites. Asteroid belt, comets and other objects of the solar system.

UNIT –II

Variety of stellar objects; classification of stars; distance scales. Current survey of galaxies; clusters, voids, quasars Hubble expansion. Mass distribution in galaxies and clusters; Dark Matter. Type II a supernova and Dark Energy.

UNIT –III

Main sequence stars, H-R Diagram. White dwarfs, neutron stars, supernovae, quasars and gamma ray bursters. Equivalence principle and a metric for the spacetime. Black Holes; FRW models; gravitational lensing.

UNIT –IV

Primordial formation of neutral Hydrogen; CMBR. Chandershekher limit, Big Bang Nucleosynthesis; Baryon to entropy ratio; Neutrinos and other relics.

Books Recommended:

1. Bradly W. Carrol and Dale A. Ostlie, An introduction to Modern Astrophysics 2nd Ed., Pearson publication
2. P. J. E. Peebles, Principles of Physical Cosmology Princeton Univ. Press (1993)
3. T. Padmanabhan, Cosmology and Astrophysics through Problems Cambridge Univ. Press (1996)
4. T. Padmanabhan, Theoretical Astrophysics, vol I, II and III (Cambridge Univ. Press (1992 - 96)

RAFFLES UNIVERSITY

SCHOOL OF BASIC AND APPLIED SCIENCES

Department of Physics

(Syllabus and Scheme of Studies w. e. f. 2015-16 onwards)

B.Sc. (PCM) II Year (IV Semester)

Practical per Week : 4 Hrs

Examination Time : 4 Hrs **Maximum Marks: 50(20+30)**

Subject : Physics Lab-IV **Paper Code : PHY-208**

Note: Students are required to perform minimum five experiments from given list.

1. Verification of Newton's Ring formula and determination of wavelength of sodium light.
2. Determination of Magnifying and Resolving power of a telescope.
3. Refractive Index and Dispersive Power of a Prism using spectrometer.
4. Determine wavelength of light using plane transmission diffraction grating.
5. Determine resolving power of a grating.
6. Specific Rotation of Sugar solution by Laurent's half-Shade Polarimeter.
7. To determine numerical aperture of the optical fiber

Wavelength of Sodium light by Fresnel's Biprism.

RAFFLES UNIVERSITY

SCHOOL OF BASIC AND APPLIED SCIENCES
Department of Chemistry
(Syllabus and Scheme of Studies w. e. f. 2016-17 onwards)
B.Sc. (PCM) II Year (IV Semester)

Schedule per week Lectures: 2
Examination Time : 3 Hrs **Maximum Marks: 50(20+30)**
Subject : Inorganic Chemistry **Paper Code : CH-202**

Note: *Examiner will set nine questions and the students will be required to attempt five questions in all, Question number one is compulsory containing six short answer types questions covering the entire syllabus and will be of 1 marks. Further examiner will be set two questions from each unit and the students will be required to attempt one question from each unit which will be of 6 marks each.*

UNIT-I

Chemistry of f -block elements:

Lanthanides: Electronic structure, oxidation states and ionic radii and lanthanide contraction, complex formation, occurrence and isolation, lanthanide compounds.

UNIT-II

Chemistry of f -block elements

Actinides: General features and chemistry of actinides, chemistry of separation of Np, Pu and Am from U, Comparison of properties of Lanthanides and Actinides and with transition elements.

UNIT-III

Theory of Qualitative and Quantitative Inorganic Analysis-I:

Chemistry of analysis of various acidic radicals, Chemistry of identification of acid radicals in typical combinations, Chemistry of interference of acid radicals including their removal in the analysis of basic radicals.

UNIT-IV

Theory of Qualitative and Quantitative Inorganic Analysis-II:

Chemistry of analysis of various groups of basic radicals, Theory of precipitation, co-precipitation, Post- precipitation, purification of precipitates.

OR

Schedule per week Lectures: 2

Examination Time : 3 Hrs **Maximum Marks: 50(20+30)**

Subject : Coordination Chemistry (Elective) **Paper Code : CH-202**

UNIT-I

Werner's theory, valence bond theory (inner and outer orbital complexes), electroneutrality principle and back bonding. Crystal field theory, measurement of 10 Dq (Δo), CFSE in weak and strong fields, pairing energies, factors affecting the magnitude of 10 Dq (Δo, Δt). Octahedral vs. tetrahedral coordination, tetragonal distortions from octahedral geometry Jahn-Teller theorem, square planar geometry. Qualitative aspect of Ligand field and MO Theory.

IUPAC nomenclature of coordination compounds, isomerism in coordination compounds. Stereochemistry of complexes with 4 and 6 coordination numbers. Chelate effect, polynuclear complexes, Labile and inert complexes.

UNIT-II

Transition Elements: General group trends with special reference to electronic configuration, colour, variable valency, magnetic and catalytic properties, ability to form complexes. Stability of various oxidation states and e.m.f. (Latimer diagrams) Different between the first, second and third transition series. Chemistry of Cr, Mn, Fe and Co in various oxidation states with special reference to the following compounds: peroxo compounds of chromium, potassium dichromate, potassium permanganate, potassium ferrocyanide, potassium ferricyanide, sodium nitroprusside and sodium cobaltinitrite.

UNIT-III

Lanthanoids and Actinoids: Electronic configuration, oxidation states, colour, spectral and magnetic properties, lanthanide contraction, separation of lanthanides (ion-exchange method only).

UNIT-IV

Inorganic Reaction Mechanism :Introduction to inorganic reaction mechanisms. Substitution reactions in square planar complexes, Trans- effect, theories of trans effect. Thermodynamic and Kinetic stability.

Reference Books:

1. Purcell, K.F• & Kotz, J.C., Inorganic Chemistry W.B. Saunders Co, 1977.
2. Huheey, J.E., Inorganic Chemistry, Prentice Hall, 1993.
3. Cotton, F.A. & Wilkinson, G., Advanced Inorganic Chemistry Wiley-VCH, 1999
4. Basolo, F, and Pearson, R.C., Mechanisms of Inorganic Chemistry, John Wiley & Sons, NY, 1967.
5. Greenwood, N.N. & Earnshaw A., Chemistry of the Elements, ButterworthHeinemann,1997.
6. Miessler, G. L. &. Tarr, Donald A. Inorganic Chemistry 3 rd Ed.(adapted), Pearson, 2009

OR

Schedule per week Lectures: 2

Examination Time : 3 Hrs **Maximum Marks: 50(20+30)**

Subject : Novel Inorganic Solids (Elective) **Paper Code : CH-202**

UNIT-I

Synthesis and modification of inorganic solids: Conventional heat and beat methods, Co-precipitation method, Sol-gel methods, Hydrothermal method, Ion-exchange and Intercalation methods.

Inorganic solids of technological importance: Solid electrolytes – Cationic, anionic, mixed Inorganic pigments – coloured solids, white and black pigments.

One-dimensional metals, molecular magnets, inorganic liquid crystals.

UNIT-II

Nanomaterials: Overview of nanostructures and nanomaterials: classification. Preparation of gold and silver metallic nanoparticles, self-assembled nanostructures-control of nanoarchitecture onedimensional control. Carbon nanotubes and inorganic nanowires. Bioinorganic nanomaterials, DNA and nanomaterials, natural and antisical nanomaterials, bionano composites. Introduction to engineering materials for mechanical construction:

Composition, mechanical and fabricating characteristics and applications of various types of cast irons, plain carbon and alloy steels, copper, aluminum and their alloys like duralumin, brasses and bronzes cutting tool materials, super alloys thermoplastics, thermosets and composite materials.

UNIT-III

Composite materials:

Introduction, limitations of conventional engineering materials, role of matrix in composites, classification, matrix materials, reinforcements, metal-matrix composites, polymer-matrix composites, fibre-reinforced composites, environmental effects on composites, applications of composites.

UNIT-IV

Speciality polymers: Conducting polymers - Introduction, conduction mechanism, polyacetylene, polyparaphenylene and polypyrole, applications of conducting polymers, Ion-exchange resins and their applications. Ceramic & Refractory: Introduction, classification, properties, raw materials, manufacturing and applications.

Reference Books:

1. Atkins, Peter, Overton, Tina, Rourke, Jonathan, Weller, Mark and Armstrong, Fraser• Shriver & Atkins' Inorganic Chemistry, 5 th Edition, Oxford University Press 2011- 2012
2. Adam, D.M. Inorganic Solids: An introduction to concepts in solid-state structural• chemistry, John Wiley and Sons, London, New York, Sydney, Toronto, 1974
3. Poole Jr., Charles P., Owens, Frank J., Introduction to Nanotechnology John Wiley and• Sons, 2003.

RAFFLES UNIVERSITY

SCHOOL OF BASIC AND APPLIED SCIENCES
Department of Chemistry
(Syllabus and Scheme of Studies w. e. f. 2016-17 onwards)
B.Sc. (PCM) II Year (IV Semester)

Schedule per week Lectures: 2
Examination Time : 3 Hrs **Maximum Marks: 50(20+30)**
Subject : Organic Chemistry **Paper Code : CH-204**

Note: *Examiner will set nine questions and the students will be required to attempt five questions in all, Question number one is compulsory containing six short answer types questions covering the entire syllabus and will be of 1 marks. Further examiner will be set two questions from each unit and the students will be required to attempt one question from each unit which will be of 6 marks each.*

UNIT-I

Infrared (IR) absorption spectroscopy: Molecular vibrations, Hooke's law, selection rules, intensity and position of IR bands, measurement of IR spectrum, fingerprint region, characteristic absorptions of various functional groups and interpretation of IR spectra of simple organic compounds. Applications of IR spectroscopy in structure elucidation of simple organic compounds.

UNIT-II

Amines: Structure and nomenclature of amines, physical properties. Separation of a mixture of primary, secondary and tertiary amines.Structural features affecting basicity of amines. Preparation of alkyl and aryl amines (reduction of nitro compounds, nitriles, reductive amination of aldehydic and ketonic compounds. Gabrielphthalimide reaction, Hofmann bromamide reaction.electrophilic aromatic substitution in aryl amines, reactions of amines with nitrous acid.

UNIT-III

Diazonium Salts: Mechanism of diazotisation, structure of benzene diazonium chloride, Replacement of diazo group by H, OH, F, Cl, Br, I, NO2 and CN groups, reduction of diazonium salts to hyrazines, coupling reaction and its synthetic application.

Nitro Compounds: Preparation of nitro alkanes and nitro arenes and their chemical reactions. Mechanism of electrophilic substitution reactions in nitro arenes and their reductions in acidic, neutral and alkaline medium.

UNIT-IV

Aldehydes and Ketones: Nomenclature and structure of the carbonyl group. Synthesis of aldehydes and ketones with particular reference to the synthesis of aldehydes from acid chlorides, advantage of oxidation of alcohols with chromium trioxide (Sarett reagent) pyridinium chlorochromate (PCC) and pyridinium dichromate.,Physical properties. Comparison of reactivities of aldehydes and ketones. Mechanism of nucleophilic additions to carbonyl group with particular emphasis on benzoin, aldol, Perkin and Knoevenagel condensations. Condensation with ammonia and its derivatives. Wittig reaction. Mannich reaction. Oxidation of aldehydes, Baeyer–Villiger oxidation of ketones, Cannizaro reaction. MPV, Clemmensen, Wolff-Kishner, $LiAlH_4$ and $NaBH_4$ reductions.

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SCHOOL OF BASIC AND APPLIED SCIENCES
Department of Chemistry
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B.Sc. (PCM) II Year (IV Semester)

Schedule per week Lectures: 2
Examination Time : 3 Hrs **Maximum Marks: 50(20+30)**
Subject : Physical Chemistry **Paper Code : CH-206**

Note: *Examiner will set nine questions and the students will be required to attempt five questions in all, Question number one is compulsory containing six short answer types questions covering the entire syllabus and will be of 1 marks. Further examiner will be set two questions from each unit and the students will be required to attempt one question from each unit which will be of 6 marks each*

UNIT-I

Thermodynamics-III: Second law of thermodynamics, need for the law, different statements of the law, Carnot's cycles and its efficiency, Carnot's theorm, Thermodynamics scale of temperature. Concept of entropy– entropy as a state function, entropy as a function of V & T, entropy as a function of P & T, entropy change in physical change, entropy as a criteria of spontaneity and equilibrium. Entropy change in ideal gases and mixing of gases.

UNIT-II

Thermodynamics-IV: Third law of thermodynamics: Nernst heat theorem, statement of concept of residual entropy, evaluation of absolute entropy from heat capacity data. Gibbs and Helmholtz functions; Gibbs function(G) and Helmholtz function (A) as thermodynamic quantities, A &G as criteria for thermodynamic equilibrium and spontaneity, their advantage over entropy change. Variation of G and A with P, Vand T.

UNIT-III

Electrochemistry-III: Electrolytic and Galvanic cells, reversible & Irreversible cells, conventional representation of electrochemical cells, EMF of cell and its measurement, Wes ton standard cell, activity and activity coefficients, Calculation of thermodynamic quantities of cell reaction (G,H& K).Types of reversible electrodes metal-metal ion gas electrode, metal–insoluble salt anion and redox electrodes. Electrode reactions, Nernst equations, derivation of cell EMF and single electrode potential. Standard Hydrogen electrode, reference electrodes, standard electrodes potential, sign conventions, electrochemical series and its applications.

UNIT-IV

Electrochemistry-IV: Concentration cells with and without transference, liquid junction potential, application of EMF measurement i.e. valency of ions, solubility product activity coefficient, potentiometric titration (acid- base and redox). Determination of pH using Hydrogen electrode, Quinhydrone electrode and glass electrode by potentiometric methods.

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SCHOOL OF BASIC AND APPLIED SCIENCES
Department of Chemistry
(Syllabus and Scheme of Studies w.e.f. 2016-17 onwards)
B.Sc. (PCM) II Year (IV Semester)

Schedule per week Practical: 6
Examination Time : 4 Hrs **Maximum Marks: 50(20+30)**
Subject : Chemistry Lab-IV **Paper Code : CH-208**

UNIT-I (Inorganic)

Preparations: Preparation of Cuprous chloride, prussion blue from iron fillings, tetraammine cupric sulphate, chrome alum, potassium trioxalatochromate (III).

UNIT-II (Physical)

1. To determine the enthalpy of neutralisation of a weak acid/weak base vs. strong base/strong acid and determine the enthalpy of ionisation of the weak acid/weak base.
2. To determine the enthalpy of solution of solid calcium chloride
3. To study the distribution of iodine between water and CCl4.

UNIT-III (Organic)

Systematic identification (detection of extra elements, functional groups, determination of melting point or boiling point and preparation of at least one pure solid derivative) of the following simple mono and bifunctional organic compounds: Naphthalene, anthracene, acenaphthene, benzyl chloride, *p*-dichlorobenzene, *m*-dinitrobenzene, *p*-nitrotoluene, resorcinol , hydroquinone, α-naphthol, β-naphthol, benzophenone, ethyl methyl ketone, benzaldehyde, vanillin, oxalic acid, succinic acid, benzoic acid, salicyclic acid, aspirin, phthalic acid, cinnamic acid, benzamide, urea, acetanilide, benzanilide, aniline hydrochloride, p-toluidine, phenyl salicylate (salol), glucose, fructose, sucrose, *o-, m-, p* nitroanilines, thiourea.

Distribution of marks

1. UNIT-I	10 (6+4) marks
2. UNIT-II	10 (6+4) marks
3. UNIT-III	10 (6+4) marks
4. Viva-voce	10 (6+4) marks
5. Lab Record	10 (6+4) marks

RAFFLES UNIVERSITY

SCHOOL OF BASIC AND APPLIED SCIENCE
Department of Mathematics
(Syllabus and Scheme of Studies w. e. f. 2016-19 onwards)
B.Sc. (PCM) II Year (IV Semester)

Lectures : 2 Hrs
Examination Time : 3 Hrs **Maximum Marks: 50(20+30)**
Paper Title : Linear Programming **Paper Code : MA-202**

Note: *Examiner will set nine questions and the students will be required to attempt five questions in all, Question number one is compulsory containing six short answer types' questions covering the entire syllabus and will be of 1 mark. Further examiner will be set two questions from each unit and the students will be required to attempt one question from each unit which will be of 6 marks each*

UNIT-I

Linear programming problems, Statement and formation of general linear programming problems, Graphical method, slack and surplus variables, standard and matrix forms of linear programming problem, Basic feasible solution.

UNIT-II

Transportation problems, Assignment problems.

UNIT-III

Fundamental theorem of linear programming, simplex method Artificial variables, Big-M method, Convex sets.

UNIT-IV

Duality in linear programming problems, Dual simplex method, Primal-dual method.

Books Recommended:

1. J.K Sharma Operations Research: Theory and Applications 5th Edition (English) 5th Edition Laxmi Publications New- Delhi
2. V. K Kapoor Operations Research: Sultan Chand and Sons
3. S.D Sharma Operations Research Publisher Kedar Nath Ram Nath
4. R. K Gupta linear programming Krishna Prakashan Media

RAFFLES UNIVERSITY

SCHOOL OF BASIC AND APPLIED SCIENCE
Department of Mathematics
(Syllabus and Scheme of Studies w. e. f. 2016-19 onwards)
B.Sc. (PCM) II Year (IV Semester)

Lectures : 2 Hrs
Examination Time : 3 Hrs **Maximum Marks: 50(20+30)**
Paper Title : Special Functions and Integral Transforms **Paper Code : MA-204**

Note: *Examiner will set nine questions and the students will be required to attempt five questions in all, Question number one is compulsory containing six short answer types' questions covering the entire syllabus and will be of 1 mark. Further examiner will be set two questions from each unit and the students will be required to attempt one question from each unit which will be of 6 marks each*

UNIT – I

Series solution of differential equations -Power series method, Definitions of Beta and Gamma functions. Bessel equation and its solution: Bessel functions and their properties-Convergence, recurrence, Relations and generating functions, Orthogonality of Bessel functions.

UNIT – II

Legendre and Hermite differentials equations and their solutions: Legendre and Hermite functions and their properties-Recurrence Relations and generating functions. Orhogonality of Legendre and Hermite polynomials. Rodrigues' Formula for Legendre & Hermite Polynomials, Laplace Integral Representation of Legendre polynomial.

UNIT-III

Laplace Transforms – Existence theorem for Laplace transforms, Linearity of the Laplace transforms, Shifting theorems, Laplace transforms of derivatives and integrals, Differentiation and integration of Laplace transforms, Convolution theorem.

UNIT-IV

Inverse Laplace transforms, convolution theorem, Inverse Laplace transforms of derivatives and integrals, change the scale property and Shifting theorems for inverse Laplace, solution of ordinary differential equations using Laplace transform. Finite Fourier transforms, Infinite Fourier transforms, Fourier integral, Application of Fourier transform to boundary value problems,

Books Recommended:

1. I.N. Sneddon: the use of integral transform, McGraw Hill, 1972
2. Murray R. Spiegel: Laplace transforms, Schaum's Series.
3. S. S Seth Integral Transforms : Students' Friends & Company
4. I.N. Sneddon: Special Functions on mathematics, Physics & Chemistry.
5. W.W. Bell: Special Functions for Scientists & Engineers.

RAFFLES UNIVERSITY

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B.Sc. (PCM) II Year (IV Semester)

Lectures : 2 Hrs
Examination Time : 3 Hrs **Maximum Marks: 50(20+30)**
Paper Title : Elective paper **Paper Code : MA-206(A)**

Programming in C and Numerical Method

Note: *Examiner will set nine questions and the students will be required to attempt five questions in all, Question number one is compulsory containing six short answer types' questions covering the entire syllabus and will be of 1 mark. Further examiner will be set two questions from each unit and the students will be required to attempt one question from each unit which will be of 6 marks each*

UNIT-I

Programmer's model of a computer, Algorithms, Flow charts, Data types, Operators and expressions, Input / outputs functions

UNIT-II

Decisions control structure: Decision statements, Logical and conditional statements, Implementation of Loops, Switch Statement & Case control structures. Functions, Preprocessors and Arrays.

UNIT-III

Strings: Character Data Type, Standard String handling Functions, Arithmetic Operations on Characters. Structures: Definition, using Structures, use of Structures in Arrays and Arrays in Structures. Pointers: Pointers Data type, Pointers and Arrays, Pointers and Functions. Solution of Algebraic and Transcendental equations: Bisection method, Regula-Falsi method, Secant method, Newton-Raphson's method. Newton's iterative method for finding pth root of a number, Order of convergence of above methods.

UNIT-IV

Simultaneous linear algebraic equations: Gauss-elimination method, Gauss-Jordan method, Triangularization method (LU decomposition method). Crout's method, Cholesky Decomposition method. Iterative method, Jacobi's method, Gauss-Seidal's method, Relaxation method.

Books Recommended:

1. B.W. Kernighan and D.M. Ritchie : The C Programming Language, 2nd Edition
2. V. Rajaraman : Programming in C, Prentice Hall of India, 1994
3. Byron S. Gottfried : Theory and Problems of Programming with C, Tata McGraw -Hill Publishing Co. Ltd., 1998
4. M.K. Jain, S.R.K. Lyengar, R.K. Jain : Numerical Method, Problems and Solutions, New Age International (P) Ltd., 1996
5. M.K. Jain, S.R.K. Lyengar, R.K. Jain : Numerical Method for Scientific and Engineering Computation, New Age International (P) Ltd., 1999
6. Computer Oriented Numerical Methods, Prentice Hall of India Pvt. Ltd.
7. Programming in ANSI C, E. Balagurusamy, Tata McGraw-Hill Publishing Co. Ltd.
8. Gupta and Malik, Numerical Analysis Krishna Prakashan Media
9. Babu Ram: Numerical Methods, Pearson Publication.
10. R.S. Gupta, Elements of Numerical Analysis, Macmillan's India 2010.

RAFFLES UNIVERSITY

OR

SCHOOL OF BASIC AND APPLIED SCIENCE

Department of Mathematics

(Syllabus and Scheme of Studies w. e. f. 2016-19 onwards)

B.Sc. (PCM) II Year (IV Semester)

Lectures : 2 Hrs

Examination Time : 3 Hrs **Maximum Marks: 50(20+30)**

Paper Title : Elective paper **Paper Code : MA-206(B)**

Differential Geomeetry and Tenssor Analysis

Note: *Examiner will set nine questions and the students will be required to attempt five questions in all, Question number one is compulsory containing six short answer types' questions covering the entire syllabus and will be of 1 mark. Further examiner will be set two questions from each unit and the students will be required to attempt one question from each unit which will be of 6 marks each*

UNIT-I

Local theory of curves space curves, examples, Plane curves, tangent and normal and binormal osculating normal plane and rectifying plane, Helices serret- Frenet apparatus, contact between curve and surfaces, tangent surfaces, involutes and evolutes of curves.

UNIT –II

Intrinsic equations, fundamental existence theorem for space curves, Local theory of surfaces Parametric patches on surface curve of a surface, surface of revolution, Helicoids, Metric first fundamental form and arc length.

UNIT –III

Local theory of surface (contd.) Direction coefficients, families of curves, intrinsic properties, geodesics, canonical geodesic equations normal properties of geodesics, geodesics curvature, geodesics polars, Gass-Bonnet theorem, Gaueeian curvature, normal curvature.

UNIT –IV

Contravariant and covariant vectors and tensors, Mixed tensors, Symmetric and skew –symmetric tensors, Algebra of tensors, Contraction and inner product, Quotient theorem, Reciprocal tensors.

Books Recommended:

1. Vasistha and Other Differential Geomeetry and Tenssor Analysis publisher Krishna Pvt. Ltd.

K.K. Dube Differential Geometry and Tensors I. K International Publishing house Pvt. Ltd.