Chhattisgarh Swami Vivekanand Technical University , Bhilai
B.Tech.(Lateral Entry)

Branch : Lateral Entry Syllabus **Subject Code – A000116(015)**
Total Marks in End semester exam – 100 **Duration of End semester Exam - 3 hours**

Physics

Unit-1 Units, Physical Quantities, Motion in Two or Three dimensions (10 hrs.)

Standards and Units, Unit consistency and conversions, Uncertainty and Significant figures, Estimates and orders of magnitude, Position and Velocity Vectors, The Acceleration Vector, Projectile motion, Motion in a Circle, Relative Velocity, Conservative and Non-Conservative Forces; Central forces, Noninertial frames of reference.

Unit-2 Wave Optics (10 hrs.)

Superposition of waves and interference of light by wavefront splitting and amplitude splitting, Fresnel biprism; wedge shaped film, Newton's rings, Fraunhofer diffraction from a single slit, Diffraction gratings.

Unit-3 Dielectrics and magnetic materials (10 hrs.)
Polarisation, Permeability and dielectric constant, Polar and non-polar dielectrics, types of polarization, Relation between E, D and P vectors, local or internal field and Clausius-Mossotti relation.

.Magnetisation, Solving for magnetic field due to simple magnets like a bar magnet, Permeability and Susceptibility, Classification of magnetic materials, Ferromagnetism, Paramagnetic and diamagnetic materials, Magnetic domains and hysteresis.

Unit -4 Semiconductors (10 hrs.)

Intrinsic and extrinsic semiconductors, Concept of Fermi Level, Dependence of Fermi level on carrier-concentration and temperature, Doping, impurity states, n and p type semiconductors, Carrier generation and recombination, Carrier transport: diffusion and drift, p-n junction, Depletion region and potential barrier, Energy band structure of PN junction in forward and reverse biasing.

Unit-5 Lasers & Fibre Optics (10 hrs.)
Einstein's theory of matter radiation interaction and A and B coefficients, amplification of light by population inversion in optical resonator, different types of lasers: gas lasers (He- Ne), solid-state lasers (ruby laser), semiconductor laser, Properties of laser beams.

Fibre Optics: Introduction, Optical fibre as a dielectric wave guide, Total internal reflection, Numerical aperture and various fibre parameters, Step and graded index fibres, Application of optical fibres.

Textbooks:

1. Engineering Physics by Gaur & Gupta, Dhanpat Rai Publications
2. Engineering Physics by PG Kshirsagar & M N Avadhanulu, S. Chand Publications
3. A. Ghatak , Optics, McGraw Hill EducationJ. Singh,
4. Semiconductor Optoelectronics: Physics and Technology McGraw-Hill Inc
5. A textbook of Engineering Physics Practical 2nd edition, University Science Press

Reference Books:

1. Sears and Zemansky's University Physics, Volume-1 Mechanics, Pearson
2. Halliday and Resnick, Physics
3. H. C. Verma, Concepts of Physics Vol – 1&2, Bharti Bhawan Publication
4. David Griffiths, Quantum Mechanics, Pearson Education
5. O. Svelto, Principles of Lasers, Springer Science & Business Media

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Chhattisgarh Swami Vivekananda Technical University, Bhilai

Semester: B.Tech - Ist
Subject: Mathematics - I
Total Marks in End Semester Exam: 100
Minimum number of Class Tests: 02

Branch: Common to all Branches
Course Code: A000112(014)
L: 3 T: 1 P: 0 Credits: 4

Course Objective:

The objective of this course is to familiarize the prospective engineers with techniques in calculus, multivariate analysis and linear algebra. It aims to equip the students with standard concepts and tools at an intermediate to advanced level that will serve them well towards tackling more advanced level of mathematics and applications that they would find useful in their disciplines. More precisely, the objectives are:

- To introduce the idea of applying differential and integral calculus to notions of curvature and to improper integrals. Apart from some applications it gives a basic introduction on Beta and Gamma functions.
- To introduce the fallouts of Rolle's Theorem that is fundamental to application of analysis to Engineering problems.
- To develop the tool of power series and Fourier series for learning advanced Engineering Mathematics.
- To familiarize the student with functions of several variables that is essential in most branches of engineering.
- To develop the essential tool of matrices and linear algebra in a comprehensive manner.

UNIT I: Calculus **(8 hours)**

Evaluation of definite and improper integrals, reduction formulae, Beta and Gamma functions and their properties; Applications of definite integrals to evaluate surface areas and volumes of revolutions.

UNIT II : Calculus **(8 hours)**

Rolle's Theorem, Mean value theorems, Taylor's and Maclaurin theorems with remainders; indeterminate forms and L'Hospital's rule; Maxima and minima.

UNIT III : Sequences and series: **(8 hours)**

Convergence of sequence and series, tests for convergence; Power series, Taylor's series, series for exponential, trigonometric and logarithm functions; Fourier series: Half range sine and cosine series, Parseval's theorem.

UNIT IV : Multivariable Calculus (Differentiation) **(8 hours)**

Limit, continuity and partial derivatives, total derivative; Tangent plane and normal line; Maxima, minima and saddle points; Method of Lagrange multipliers; Gradient, curl and divergence directional derivatives.

UNIT V : Matrices **(8 hours)**

Rank of a matrix by elementary transformation, normal form of a matrix, System of linear equations; Symmetric, skewsymmetric and orthogonal matrices; Eigen values and eigenvectors; Diagonalization of matrices; Cayley-Hamilton Theorem and Orthogonal transformation.

Text/Reference Books

1. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002.
2. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
3. D. Poole, Linear Algebra: A Modern Introduction, 2nd Edition, Brooks/Cole, 2005.
4. Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008.
5. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11thReprint, 2010.
6. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2010.
7. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 35th Edition, 2000.
8. V. Krishnamurthy, V.P. Mainra and J.L. Arora, An introduction to Linear Algebra,Affiliated East–West press, Reprint 2005.

Course Outcomes:

The objective of this course is to familiarize the prospective engineers with techniques in basic calculus and linear algebra. It aims to equip the students with standard concepts and tools at an intermediate to advanced level that will serve them well towards tackling more advanced level of mathematics and applications that they would find useful in their disciplines.

The students will learn:

- To apply differential and integral calculus to notions of curvature and to improper integrals. Apart from various applications, they will have a basic understanding of Beta and Gamma functions.
- The essential tools of matrices and linear algebra including linear transformations, eigen values, diagonalization and orthogonalization.

Chhattisgarh Swami Vivekananda Technical University, Bhilai

Semester: B.Tech – 2nd
Subject: Chemistry-I
Total Marks in End Semester Exam: 100
Minimum number of Class Tests: 02

Branch: Common to all Branches
Course Code: A000211(011)
L: 3 T: 1 P: 0 Credits: 4

Unit I – V is common for all braches except Chemical Engineering

Unit VI – X are specific to Chemical Engineering

Unit – I

Atomic & molecular structure — 10 hours

Molecular orbital Theory: Equations for atomic and molecular orbitals (LCAO), Energy level diagram of homo (H_2, N_2, O_2, Li_2, F_2) & hetero molecules (CO, NO, HF), Concept of bond order. Pi-molecular orbitals of butadiene, benzene and aromaticity.

Crystal Field Theory: Splitting of d-orbital of octahedral and tetrahedral complexes, Energy level diagram of transition metal ion & magnetic property, numerical based on Crystal field stabilization energy.

Unit – II

Spectroscopic techniques and applications — 10 hours

Principle of spectroscopy. Electromagnetic radiation, Spectrophotometer (line diagram)

Electronic Spectroscopy (Ultraviolet–visible spectroscopy): Theory, Types of electronic transition, Chromophore, auxochromes , Electronic excitation in conjugated dienes , Absorption Laws, applications on quantitative analysis , Simple numerical based on absorption laws and uses or application of Electronic Spectroscopy

Vibrational spectroscopy (Infrared spectroscopy): Molecular vibration, Selection rule, functional group region, fingerprint region and uses or application of Vibrational spectroscopy.

Nuclear magnetic resonance spectroscopy: Introduction, number of signal, chemical shift, Spin-spin coupling and uses or application of Nuclear magnetic resonance spectroscopy.

Unit – III — 8 hours

Use of free energy in Chemical Equilibria

Thermodynamic Functions: Energy, Entropy, Free energy, Cell potential & related numericals, Estimations of entropy and free energies, Nernst Equation & its application to voltaic cell, Relation of free energy with EMF.

Corrosion: Electrochemical theory of corrosion, galvanic series, Galvanic corrosion, Differential aeration corrosion, Pitting, and Water line corrosion, Caustic embrittlement, factors affecting corrosion , Cathodic Protection.

Unit –IV

Periodic properties — 8 hours

Periodic table, atomic and ionic radii, ionisation energies, electron affinity, electronegativity.

Effective nuclear charge, penetration of orbitals, variations of s, p, d and f orbital energies of atoms. Polarizability, Oxidation states, coordination numbers and geometries, Hard, soft acids and bases (Classification, Pearsons HSAB principle, its applications & limitations) Molecular Geometry (Valence shell electron pair repulsion theory to NH_3, H_3O+, SF_4, ClF_3, ICl_2 and H_2O), Numerical based on effective nuclear charge.

Unit -V **8 hours**

Organic reactions and synthesis of drug molecule

Introduction to reactions involving substitution (free radical-Chlorination of molecule, Gomberg reaction, Wurtz reaction, Electrophilic, Nucliophilic-SN^1 SN^2), Addition (Electrophilic–Morkownihoff rule,Nuclophilic)Elimination (α elimination , β elimination , unimolecular E_1, biomolecular E_2), oxidation (Baeyer villiger oxidation), reduction (Clemmensen reduction, Wolff-Kishner reduction) cyclization (Bergman Cyclization) and ring openings and rearrangement reaction (Beckamann, Reimer-Tiemann reaction, Canannizaro, crossed cannizzaro reaction)

Synthesis of a commonly used drug molecule: General guidelines of drug making, synthesis of Aspirin, Ibuprofen, Paracetamol.

Unit -VI

Introduction to quantum theory **8 hours**

Schrodinger equation & its importance, Applications to hydrogen atom, Wave mechanical model for many electron atoms-radial distribution curves.

Unit -VII **10 hours**

Chemical bonding in molecules:

MO theory, Structure, bonding and energy levels of bonding and shapes of many atom molecules, Coordination Chemistry, Electronic spectra and magnetic properties of complexes with relevance to bio-inorganic chemistry, organometallic chemistry.

Unit -VIII **8 hours**

Stereochemistry:

Introduction to Stereochemistry: Representations of 3 dimensional structures, Chirality, Optical activity. Isomerism- structural isomerism, stereoisomers, enantiomers, diastereomers, Configurations (D, L &R, S), Geometrical isomerism (cis and trans & E and Z). Racemic modification & their resolution, Isomerism in transitional metal compounds.

Conformational analysis: Conformations of cyclic (cyclohexane) and acyclic compounds (ethane & butane).

Unit -IX

Reactivity of organic molecules: **8 hours**

Organic acids and bases: factors influencing acidity, basicity, and nucleophilicity of molecules, kinetic vs. thermodynamic control of reactions.

Unit -X **10 hours**

Strategies for synthesis of organic compounds:

Reactive intermediates substitution, elimination, rearrangement, kinetic and thermodynamic aspects, role of solvents.

Course Outcomes:

The concepts developed in this course will aid in the quantification of several concepts in chemistry that have been introduced at the 10+2 levels in schools. Technology is being increasingly based on the electronic, atomic and molecular level modifications. Quantum theory is more than 100 years old and to understand phenomena at nanometer levels, one has to base the description of all chemical processes at molecular levels. The course will enable the student to:

- Analyse microscopic chemistry in terms of atomic and molecular orbital's and intermolecular forces.
- Distinguish the ranges of the electromagnetic spectrum used for exciting different molecular energy levels in various spectroscopic techniques.
- Rationalise bulk properties and processes using thermodynamic considerations.
- Rationalise periodic properties such as ionisation potential, electro negativity, Oxidation states.
- List major to significant chemical reactions that are used in the synthesis of molecules.
- Use the knowledge of quantum theory in various chemical systems.
- Appreciate aliphatic chemistry and stereochemistry
- Write simple mechanisms

Text Books:

1. A.TextBookofEngg.Chemistry,ShashiChawala,DhanpatRai&Co.(P)Ltd.
2. EngineeringChemistrybyP.C.Jain(DhanpatRaiPublishingCompany.
3. Engineering Chemistry,Concept in engineering Chemistry by Satyaprakash and Manisha Agrawal by Khanna Publication.

Books for Chemical Engineering:

1. AdvancedInorganicChemistryVol1&IIbyGurdeepRaj,GoelPublishingHouse.
2. OrganicReactionandTheirMechanismP.S.Kalsi,NewAgeInternational Publishers.

Reference Books:

1. Universitychemistry, by B. H. Mahan
2. Chemistry:PrinciplesandApplications,byM.J.SienkoandA.Plane
3. FundamentalsofMolecularSpectroscopy,byC. N. Banwell
4. Engineering Chemistry (NPTEL Web-book), by B. L. Tembe,Kamaluddin and M. S. Krishnan
5. PhysicalChemistry, by P. W. Atkins
6. OrganicChemistry:StructureandFunctionbyK.P.C.VolhardtandN.E. Schore, 5thEdition
7. EssentialsofPhysicalChemistry,Bahi&Tuli,S.ChandPublishing
8. Introductionto Nanoscience by S. M. Lindsay

Chhattisgarh Swami Vivekananda Technical University, Bhilai

Semester: B.Tech – 2nd
Subject: Mathematics - II
Total Marks in End Semester Exam: 100
Minimum number of Class Tests: 02

Branch: Common to all Branches
Course Code: A000212(014)
L: 3 T: 1 P: 0 Credits 4

Course Objective:

The objective of this course is to familiarize the prospective engineers with techniques in multivariate integration, ordinary and partial differential equations and complex variables. It aims to equip the students to deal with advanced level of mathematics and applications that would be essential for their disciplines. More precisely, the objectives are:

- To acquaint the student with mathematical tools needed in evaluating multiple integrals and their usage.
- To introduce effective mathematical tools for the solutions of differential equations that model physical processes.
- To introduce the tools of differentiation and integration of functions of complex variable that are used in various techniques dealing engineering problems.

UNIT I

Multivariable Calculus (Integration) **(8 hours)**

Double and triple integrals (Cartesian), change of order of integration in double integrals, Change of variables (Cartesian to polar), Applications: areas and volumes, Center of mass and Gravity (constant and variable densities); Triple integrals (Cartesian),

Orthogonal curvilinear coordinates, Simple applications involving cubes, sphere and rectangular parallelepipeds; Scalar line integrals, vector line integrals, scalar surface integrals, vector surface integrals, Theorems of Green, Gauss and Stokes (without proof) & its applications.

UNIT II

First order ordinary differential equations **(8 hours)**

Exact, linear and Bernoulli's equations, Euler's equations, Equations of first order and higher degree: equations solvable for p, equations solvable for y, equations solvable for x and Clairaut's type.

UNIT III

Ordinary differential equations of higher orders **(8 hours)**

Higher order linear differential equations with constant coefficients & variable coefficients, method of variation of parameters, Cauchy-Euler equation.

Power series solutions; Legendre polynomials and their properties, Bessel functions of the first kind and their properties.

UNIT IV

Complex Variable – Differentiation **(8 hours)**

Differentiation, Cauchy-Riemann equations, analytic functions, harmonic functions, finding harmonic conjugate; elementary analytic functions (exponential, trigonometric, logarithm) and their properties; Conformal mappings, Mobius transformations and their properties.

UNIT V

Complex Variable – Integration **(8 hours)**

Contour integrals, Cauchy-Goursat theorem (without proof), Cauchy Integral formula (without proof), Liouville's theorem and Maximum-Modulus theorem (without proof); Taylor's series, zeros of analytic functions, singularities, Laurent's series. Residues, Cauchy Residue theorem (without proof), Evaluation of definite integral involving sine and cosine, Evaluation of certain improper integrals using the Bromwich contour.

Textbooks/References:

1. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson,Reprint, 2002.
2. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons,2006
3. W. E. Boyce and R. C. DiPrima, Elementary Differential Equations and Boundary Value Problems,9th Edn., Wiley India, 2009.
4. S. L. Ross, Differential Equations, 3rd Ed., Wiley India, 1984.
5. E. A. Coddington, An Introduction to Ordinary Differential Equations, Prentice HallIndia, 1995.
6. E. L. Ince, Ordinary Differential Equations, Dover Publications, 1958.
7. J. W. Brown and R. V. Churchill, Complex Variables and Applications, 7th Ed., Mc-Graw Hill, 2004.
8. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.
9. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.