

**SWAMI VIVEKANAND UNIVERSITY, SIRONJA,
SAGAR (M.P.)**



SYLLABUS

For

***B.TECH CHEMICAL ENG.
4TH SEM***

**Swami Vivekanand University, Sironja Sagar
2013-2014**

SCHEME B.TECH CHEMICAL SEM-IV

SUBJECT CODE	SUBJECT
BT-401	MATHEMATICS - 3
CH-402	PHYSICAL AND INORGANIC CHEMISTRY
CH-403	PROCESS HEAT TRANSFER
CH-404	CHEMICAL ENGINEERING THERMODYNAMICS-1
CH-405	MANAGEMENT - I
CH-406	JAVA PROGRAMMING
CH-407	SELF STUDY (INTERNAL ASSESMENT)
CH-408	SEMINAR / GROUP DISCUSSION (INTERNAL ASSESSMENT)

SCHEME OF EXAMINATION

SUBJECT CODE	THEORY				PRACTICAL			CREDIT		TOTAL	TH- THEORY MS- MID SEM TQ- THEORY QUIZ TW- THEORY TERM WORK PR- PRACTICAL LW- LAB WORK PQ- PRACTICAL QUIZ G - GRADE GP- GRADE POINT F\$-ABSENT #-GRACE	
	TH	MS	TQ	TW	PR	LW	LQ	TH	PR	MAX		
	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MIN	MIN		
BT-401	70	22	20	-	10	-	-	-	-	4	-	100
CH-402	70	22	20	-	10	-	-	-	-	4	-	100
CH-403	70	22	20	-	10	-	-	30	9	20	-	150
CH-404	70	22	20	-	10	-	-	30	9	20	-	150
CH-405	70	22	20	-	10	-	-	30	9	20	-	150
CH-406	-	-	-	-	-	-	-	30	-	20	-	50
CH-407	-	-	-	-	-	-	-	-	-	50	-	50
CH-408	-	-	-	-	-	-	-	-	-	50	-	50

Subject Name Mathematics-3

Sr.No	Course content
1.	Complex numbers and functions: Limits of Functions, Continuity, Differentiability, Analytic functions, Cauchy-Riemann Equations, Necessary and Sufficient condition for analyticity, Properties of Analytic Functions, Laplace Equation, Harmonic Functions, Finding Harmonic Conjugate functions Exponential, Trigonometric, Hyperbolic functions and its properties. Multiple valued function and its branches: Logarithmic function and Complex Exponent function.
2.	Complex Integration: Curves, Line Integrals (contour integral) and its properties. Line integrals of single valued functions, Line integrals of multiple valued functions (by choosing suitable branches). Cauchy-Goursat Theorem, Cauchy Integral Formula, Liouville Theorem, Fundamental Theorem of Algebra, Maximum Modulus Theorems.
3.	Power Series: Convergence (Ordinary, Uniform, Absolute) of power series, Taylor and Laurent Theorems, Laurent series expansions. Zeros of analytic functions. Singularities of analytic functions and their classification Residues: Residue Theorem, Rouché's Theorem, Argument Principle.
4.	Applications of Contour Integration: Evaluating various type of definite real integrals using contour integration method.
5.	Conformal Mapping and its applications: Mappings by elementary functions, Mobius transformations, Schwarz-Christoffel transformation.
6.	Interpolation: Interpolation by polynomials, divided differences, error of the interpolating polynomial.
7.	Numerical integration: Composite rules, error formulae, Gaussian integration.
8.	Linear algebraic equation: Solution of a system of linear equations: implementation of Gaussian elimination and Gauss-Seidel methods, partial pivoting.

9.	Roots of equation: Solution of a nonlinear equation: Bisection and Secant methods, Newton's method, rate of convergence, Power method for computation of Eigen values.
10.	Ordinary differential equations: Numerical solution of ordinary differential equations, Euler and Runge-Kutta methods.

Reference Books:

- 1) R. V. Churchill and J. W. Brown, Complex variables and applicati (7th Edition), McGraw-Hill (2003).
- 2) J. M. Howie, Complex analysis, Springer-Verlag (2004).
- 3) M. J. Ablowitz and A. S. Fokas, Complex Variables- Introduction and Applications, Cambridge University Press, 1998 (Indian Edition).
- 4) E. Kreyszig, Advanced engineering mathematics (8th Edition), John Wiley (1999).
- 5) S. D. Conte and Carl de Boor, Elementary Numerical Analysis- An Algorithmic Approach (3rd Edition), McGraw-Hill, 1980.
- 6) C. E. Froberg, Introduction to Numerical Analysis (2nd Edition), Addison-Wesley, 1981.

Subject Name Physical And Inorganic Chemistry

Sr.No	Course contents
1	Phase Rule: Introduction Phace(p) etc. one, two component system, Eutectic system.
2	Electron Displacement : Introduction, Reactive intermediate, Electron displacement effect, inductive effect, Resonance, steric effect, hyper consumption.
3	Thermochemistry : Energy, Nature of Energy, Energy change in Reactions, Calorimetry, Heat of Solution & Dilution, Effect of Temp. & Pr. On chemical reaction with change in enthalpy, entropy and free energy. Industrial application in details.
4	Electrochemistry : Introduction, Electrochemical Cell, All kinds of Cell, Electrochemical Series & its application, EMF, Acid-Base, pH & pOH and its relation, Buffer solution, Application of pH in controlling of Reaction, Batteries, Fuel Cells
	Instrumental Method of Analysis : Introduction, Chromatography, GC, HPLC, Adsorption Spectroscopy, Lambert, Beer's law & its derivation, Spectroscopy, Calorimetric Analysis, UV Spectroscopy, Infrared, Thermal Methods of Analysis, Thermogravimetric Analysis, Examples, Conductometric Analysis, Potentiometric Analysis, Applications Metals & Alloys : Introduction, Physical Properties of Metals, Metallurgy: Cast Iron, Wrought Iron, Steel; Heat Treatment of Steel, Nickel, Chromium, Vanadium, Tungsten alloys, Steel alloys; Applications, Non Ferrous Alloys, Chemistry of Non Transitional Elements, Transition Metal and Co-ordination Compound, Theories, Isomerism, Applications
5	Metals & Alloys : Introduction, Physical Properties of Metals, Metallurgy: Cast Iron, Wrought Iron, Steel; Heat Treatment of Steel, Nickel, Chromium, Vanadium, Tungsten alloys, Steel alloys; Applications, Non Ferrous Alloys, Chemistry of Non Transitional Elements, Transition Metal and Co-ordination Compound, Theories, Isomerism, Applications
6	Chemical Bonding : Introduction, Nature of Bonding, Ionic, Co-valent, Co-ordinate, Hydrogen, Metallic bonds and their properties, Theories of Bonding (MO., VB. etc), Dipole Moment, Delocalized NIO Theories, Intermolecular Force, Crystal Structure Solid-Liquid, Kinetic Theories, Phase Change, Liquid Crystals

7	Explosives & Propellants : Explosives, Classifications, Precautions during the storage of Explosives, Manufacturing of Important Explosives, Rocket Propellants, Classification of Propellants
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Reference Books:

1. Physical chemistry – Semul Glastene
2. Inorganic Chemistry, by Cotton & Wilkinson
3. Physical chemistry – P.L.Soni & Dharma
4. Physical Chemistry – Bahal & Tulli
5. Physical Chemistry –Atkin, 8th Edition, 2008
6. Chemistry -Raymond Chang

Subject Name Process Heat Transfer

Sr.No	Course contents
1	Introduction to three modes of heat transfer: Conduction convection & radiation. General laws of heat transfer.
2	Conduction: Fourier's law. Conductivity, its variation with temp. & Pressure and its relationship with electrical conductivity. Heat transfer through composite walls and cylinders. Unsteady state heat transfer through some important shapes. Insulating materials general properties & application.
3	Natural convection: Natural convection from vertical plates & horizontal cylinders. Forced convection: In laminar flow - Heat transfer in plate & in tubes. In turbulent flow - Empirical equations for individual coefficients: inside tubes, outside tubes, outside bundle of tubes, flow past spheres. Significance of Prandtl No., Nusselt No., Grashof No., Graetz No. & Peclet No. Correction for tube length. Correction for heating and cooling and other corrections. Various analogies between heat & momentum transfer.
4	Radiation: Radiation laws like Stefan Boltzman's law, Kirchoff's law, Wien's law, Plank's law etc. Black body, Grey body. Transmittivity, Absorptivity, Reflectivity, Emissivity of black bodies and gray bodies. Application of thermal radiation: Radiation Transfer between surfaces. Radiation through semi transparent materials.
5	Heat transfer with phase change: Boiling of liquids, Pool boiling curve, different types of pool boiling, condensation of vapor. Film wise & drop wise condensation. Weighted LMTD & Overall Heat transfer Coefficient for desuperheating & sub cooling.
6	Evaporation: Performance of tubular evaporator. Individual & overall coefficients. Capacity & economy of evaporators. Boiling point elevation, Duhring's rule, Effect of liquid head & friction on pressure drop. Types of evaporators. -Multiple effect evaporators. -Vapor recompression-Thermal recompression & mechanical recompression.
7	Heat Exchange equipments: -Double pipe heat exchangers. Individual and overall heat transfer coefficient LMTD. Variable overall Heat transfer. Coefficient fouling factors. Shell & tube heat exchangers. LMTD correction factors. General constructions.-Extended surface equipment. Fin efficiency. Fin effectiveness

Reference Books:

1. "Heat Transmission" : W. H. McAdams, McGraw Hill, 3rd Edition.
2. "Process Heat Transfer" : D. Q. Kern, McGraw Hill.
3. McCabe W L, Smith J C, Harriott P, "Unit Operations of Chemical Engineering", 7th Ed. McGraw Hill, 2005
4. Fundamentals of Engineering heat and mass transfer by R.C. Sachdeva

Subject Name Chemical Engineering Thermodynamics-1

Sr.No	Course contents
1	Introduction: Conservation of energy and first law of thermodynamics, application to steady state flow process; enthalpy, internal energy, equilibrium state, phase rule, irreversible vs. reversible process, heat capacity and specific heat.
2	Properties of pure substances: PVT behavior of pure substances, ideal and non-ideal gases, equation of states, Virial, Van der Waals, Redlich kwong equation , RKS equation, PR equation, Berthelot equation etc., Calculation of constants in terms of P_c , T_c , V_c , condition to be satisfied by any equation of state, reduced forms of equations of state, principles of corresponding states.
3	Heat effects: Heat capacities of gases as a function of temperature, Heat capacities of gases, liquids and solids, Concept of C_{pm} , Heat of vaporization, Heat of fusion, Heat of sublimation, Heat of formation (ΔH_f), Laws of thermo chemistry, Heat of combustion (ΔH_c), Heat of reaction ΔH_r from ΔH_c , Heat of reaction (ΔH_r) from ΔH_f etc., thermo-neutrality of salt solution, Heat formation of ions and atoms, Heat of solution, Heat of solution of hydrate,
4	Second Law of thermodynamics: Second law of thermodynamics, Thermodynamic temperature scale, Ideal gas temperature scale, Concept of entropy, entropy change and irreversibility, Introduction to third law of thermodynamics.
5	Thermodynamic properties of fluids: Network of thermodynamic equations, mathematical relations among thermodynamic functions, Maxwell relations, Interrelations between H, S, G, E, C_p , C_v , etc. in terms of PVT relations (exhaustive treatment), Thermodynamic properties of single phase and two phase systems, Effect of temperature and pressure, on various properties and their evaluations, Types of thermodynamic diagrams, generalized correlations of thermodynamics properties of ideal gas mixtures.
6	Residual properties: Departure functions
7	Thermodynamics of flow process: Fundamental equations and relationships flow in pipes, maximum velocity in pipe flow, nozzles, Single and Multistage compressors and ejectors.

8	<p>Refrigeration and liquefaction: Basic of Carnot refrigeration cycle, Air refrigeration cycle, Vapor compression cycle, Absorption refrigeration, Heat pump, liquefaction processes, Refrigeration through solar energy, Cascade refrigeration., Power cycles, Recent advancement in refrigeration and liquefaction cycle design.</p>
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Reference Books:

- 1 Smith J.M, Van Ness H.C., Abbott M. M, "Introduction to Chemical Engineering Thermodynamics", The McGraw Hill Companies, Inc., USA, 7th Ed., 2005
- 2 Narayanan K.V., "Chemical Engineering Thermodynamics",
- 3 Rao Y.V.C., "Introduction to Chemical Engineering Thermodynamics", Wiley Eastern. 1994

- 4 Karapetyants M. Kh., "Chemical Thermodynamics" Mir Publishers.
- 5 Elliot J. R. and Lira C.T, "Introductory Chemical Engineering Thermodynamics ", Prentice Hall, 1999
- 6 Kyle B.G., "Chemical and Process Thermodynamics"3rd Ed., Prentice Hall, 1999
- 7 Sandler S.I, "Chemical Engineering Thermodynamics", John Wiley and Sons, Inc., New York, 3rd Ed., 1999
- 8 Dodge B.F., `Chemical Engineering Thermodynamics', McGraw Hill.1960
- 9 Weber H.C. and Meissner J.P., "Thermodynamics for Chemical Engineers", Wiley Eastern

Subject Name: Management – I

Sr. No	Course content
1.	Introduction to Management and Organizations Innovative management for Turbulent times Functions of management Planning, Organizing, Controlling and Leading Types of Managers Managerial Roles
2.	Management history Schools of Management Scientific management The Behavioral Approach The Systems approach The contingency approach
3.	Organizational Structure and Design Types of structures Work specialization Departmentalization Chain of Command Span of Control Centralization and Decentralization Formalization
4.	Organizational Culture and Environment Concept of culture and its importance Attributes of culture How does culture affect managers and employees
5.	Social responsibility and Managerial ethics Concept of corporate social responsibility and ethics Stakeholders and its management Ethical issues in management

Reference Books:

- 1 'Management' – Stephen P. Robbins, Mary Coulter, Neharika Vohra – Pearson Prentice Hall of India, New Delhi, Tenth edition
- 2 'Essentials of Management', Koontz and Weihrich, Tata McGraw Hill, 2004, 6th Edition
- 3 Essentials of management – Adrew J. Durbrin, India edition, 7th Edition, Thomson – South Western
- 4 Principles of Management, Charles WL Hill and Steven L McSane, The McGraw Hill Companies, 2008
- 5 Principles of Management, Richard L. Daft, Cengage Learning, 2009