Faculty of Engineering & Technology
P.K.University
Shivpuri (MP)

Department of Chemical Engineering

Evaluation Scheme & Syllabus for

B.Tech. Third Year

(V & VI SEM)

(Effective from session 2025-26)

EVALUATION SCHEME
B.TECH. CHEMICAL ENGINEERING
3rd Year (5th Semester)

Study And Evaluation Scheme For B.Tech Chemical Engineering

Year- 3rd /Semester -5th

Subject Code	Subjects Name	Study Scheme Periods/Week			Credits	Marks in Evaluation Scheme						Total Marks of Internal & External
						Internal Assessment			External Assessment			
		L	T	P		Th	Pr	Total Internal	Th	Pr	Total External	Grand Total
UMANACH501	Managerial Economics	4	0	0	4	30	-	30	70	-	70	100
UCHEMCH502	Chemical Reaction Engineering I	3	0	0	3	30	-	30	70	-	70	100
USOCICH503	Sociology	3	0	0	3	30	-	30	70	-	70	100
UMASSCH504	Mass Transfer-II	3	0	0	3	30	-	30	70	-	70	100
UCHEMCH505	Chemical Technology	3	0	0	3	30	-	30	70	-	70	100
UCOMPCH506	Computational Fluid Dynamics	3	0	0	3	30	-	30	70	-	70	100
UCHEMCH507	Chemical Reaction Engineering Lab	0	0	2	1	-	25	25	-	25	25	50
UMASSCH508	Mass Transfer-II Lab	0	0	2	1	-	25	25	-	25	25	50
UCHEMCH509	Chemical Technology Lab	0	0	2	1	-	25	25	-	25	25	50
USOFTCH510	Soft computing Lab	0	0	2	1	-	25	25	-	25	25	50
Total		19	0	6	23	180	100	280	420	100	520	800
For pass the candidate is required to obtain 40% marks in each paper and 50% marks in aggregate.												400

Department of Chemical Engineering
(Faculty of Engineering & Technology)
P.K. University, Shivpuri (MP)
III Year Semester-V

L	T	P
4	0	0

UMANACH501: MANAGERIAL ECONOMICS

Unit	Topic	
I	**Introduction of Engineering Economics and Demand Analysis**: Meaning and nature of Economics, Relation between science, engineering, technology and economics; Meaning of Demand, Determinants of Demand, Shifts in demand, Law of Demand, Price Elasticity of Demand &Types, Income Elasticity, Cross price Elasticity, Determinants of Elasticity, uses and importance of elasticity.	**06**
II	**Concept of Supply**: Law of Supply, Factors affecting Supply, Elasticity of supply. **Demand Forecasting**: Introduction, Meaning and Forecasting, Methods or Techniques of Demand Forecasting, Criteria for Good Demand Forecasting, Demand Forecasting for a New Product;	**06**
III	**Cost Analysis**- Introduction, Types of Costs, Cost-Output Relationship: Cost Function, Cost-Output Relationships in the Short Run, and Cost-Output Relationships in the Long Run; Short run and long run, Break- Even Analysis; Production functions: laws of variable proportions, law of returns; Economies of scale: Internal and external.	**06**
IV	Market Structure: Market Structure Perfect Competition, Imperfect competition – Monopolistic, Oligopoly, duopoly sorbent features of price determination and various market conditions.	**06**
V	Nature and characteristics of Indian economy, concepts of LPG, elementary concepts of National Income, Inflation and Business Cycles ,Concept of N.I. and Measurement., Meaning of Inflation, Types and causes , Phases of business cycle .Investment decisions for boosting economy(National income and per capital income)	**06**

References:
1. Premvir Kapoor, Sociology and Economics for Engineers, Khanna Publishing House (Edition 2018)
2. Salvatore D, ―Principles of Microeconomics‖, Oxford University Press.
3. Koutsoyiannis A, ―Modern Microeconomic‖, Macmillan Education Ltd.
4. Dwivedi DN, ―Principles of Microeconomics‖, Pearson Education.
5. Cowell, FA, ―Microeconomic Principles and Analysis‖, Oxford University Press.

Department of Chemical Engineering
(Faculty of Engineering & Technology)
P.K. University, Shivpuri (MP)
III Year Semester-V

L	T	P
3	0	0

UCHEMCH502: CHEMICAL REACTION ENGINEERING

UNIT 1

Rate of Reaction, Elementary and non-elementary homogeneous reactions, Molecularity and order of reaction, Mechanism of reaction, temperature dependency from thermodynamics, collision and activated complex theories. Integral and differential methods for analyzing kinetic data, interpretation of constant volume reactor, zero, first, second and third order reactions, half life period, irreversible reaction in parallel and series, catalytic reaction, auto catalytic reaction, reversible reactions.

UNIT 2

Interpretation of variable volume batch reactions for zero, first and second order reactions, design equation for batch, continuous stirred tank, plug flow reactors for isothermal reaction.

UNIT 3

Optimum reactor size, plug flow/mixed flow reactors in series and parallel, recycle reactor.

UNIT 4

Design of reactors for multiple reactions, parallel and series reactions. Temperature and pressure effects for single reaction.

UNIT 5

Residence time distribution of fluids in vessels, E, F and C curves, Dispersion model, Tank in series model. Non Isothermal PFR and CSTR, Safety issues in Non Isothermal Reactors.

Text Books:
1. Smith, J, M, ―Chemical Engineering Kinetics‖, 3rd Edition, McGraw-Hill (1990).
2. Levenspiel, O., ―Chemical Reaction Engineering‖, 3rd Edition, John Wiley (1998).
3. Fogler, H.S., 2016. Elements of chemical reaction engineering.

Reference Book:
1. Keith J. Laidler, ―Chemical Kinetics‖ 3rd Edition, Pearson (2013)

Department of Chemical Engineering
(Faculty of Engineering & Technology)
P.K. University, Shivpuri (MP)
III Year Semester-V

L	T	P
3	0	0

UINDUCH503: INDUSTRIAL SOCIOLOGY

Unit	Topic	
I	Industrial Sociology: Nature, Scope and Importance of Industrial Sociology. Social Relations in Industry, Social Organisation in Industry- Bureaucracy, Scientific Management and Human Relations.	06
II	Rise and Development of Industry: Early Industrialism – Types of Productive Systems – The Manorial or Feudal system. The Guild system, The domestic or putting-out system, and the Factory system. Characteristics of the factory system. Causes and Consequences of industrialization. Obstacles to and Limitations of Industrialization.	06
III	Industrialization in India. Industrial Policy Resolutions – 1956.Science. Technology and Innovation Policy of India 2013.	06
IV	Contemporary Issues: Grievances and Grievance handling Procedure. Industrial Disputes: causes, Strikes and Lockouts. Preventive Machinery of Industrial Disputes: Schemes of Workers Participation in Management- Works Committee, Collective Bargaining, Bi-partite & Tri-partite Agreement, Code of Discipline, Standing Orders. Labour courts & Industrial Tribunals.	06
V	Visualizing the future: Models of industrialization- Collectivist, anarchist, free market, environmentalist, etc. Cultural issues, consumer society and sociological concerns.	06

Department of Chemical Engineering
(Faculty of Engineering & Technology)
P.K. University, Shivpuri (MP)
III Year Semester-V

L	T	P
3	0	0

UMASSCH504:MASS TRANSFER– II

UNIT 1
Distillation: Basic fundamentals of distillation, Pressure-composition, Temperature-concentration, Enthalpy- concentration diagrams for ideal and non-ideal solutions, Raoult's law and its application, Maximum and minimum boiling mixtures, concept of relative volatility, Single Stage Distillation Differential distillation, Flash vaporization, Vacuum, molecular and steam distillation.

UNIT 2
Continuous Distillation of Binary Mixtures : Multistage contact operations, Characteristics of multistage tower, McCabe Thiele method, Ponchon Savarit method, Reflux, maximum, minimum and optimum reflux, Use of open steam, Tray efficiency, Determination of height and column diameter, Multistage batch distillation; Principles of azeotropic and extractive distillation, Introduction & Design of multicomponent distillation system.

UNIT 3
Liquid-Liquid Extraction: Ternary liquid equilibria, Triangular graphical representation concept of theoretical or ideal stage, Equipment used for single stage and multistage continuous operation; Analytical and graphical solution of single and multistage operation Super critical fluid extraction.

UNIT 4
Solid /Liquid Extraction: Leaching, Solid liquid equilibrium, Equipment used in solid – liquid extraction, Single and multistage cross current contact and counter current operations. Concept of an ideal stage, Overall stage efficiency, Determination of number of stages.

UNIT 5
Adsorption: Description of adsorption processes and their application, Types of adsorption, Nature of adsorbents adsorption equilibria and adsorption hysteresis, Stage wise and continuous
contact adsorption operations, Determination of number of stages, Ion exchange Equipments, Equilibrium relationship, Principle, techniques and applications of Ion-exchange, , Principles and application of Dialysis, Osmosis, Reverse osmosis, Thermal diffusion, Sweep diffusion.

Text Books:
1. Treybal, R ―Mass Transfer Operations‖, 3rd Editon, New York: McGraw-Hill, (1980).
2. Sherwood T. K., Pigford R. L. and Wilke P. ―Mass Transfer‖ McGraw Hill (1975)

Reference Books:
1. Foust A. S. et.al., ―Principles of Unit Operations‖ John Wiley (1980).
2. Geankoplis, C.J.. ―Transport Processes and Unit Operations‖, 3rd Editon, Prentice Hall. (1993)

L	T	P
3	0	0

UCHEMCH505:CHEMICAL TECHNOLOGY

Introduction of CPT with reference to Indian resources, industries, trade and export potential, small scale industries and rural development. Preparation of process flow diagrams, Instrumentation diagrams and Process symbols. ; Introduction to the following industries lying emphasis on process flow sheet, material requirements, process conditions, material of construction and design aspects.

UNIT 1

Introduction - Mono and Disaccharides - Important reactions - Polysaccharides - Starch and Cellulose - Derivatives of Cellulose - Carboxy Methyl Cellulose and gun cotton - Structural aspects of cellulose.

UNIT 2

Sugar, Glucose, Starch, Fermentation products such as Alcohol, Acetic acid, Citric acid and antibiotics

UNIT 3

Soap and Surfactants, Glycerin, Fatty acids, Hydrogenation of edible oils, paper and pulp

UNIT 4

Synthetic and natural fibers: Nylon, Dacron, Terylyne, Polyester and other new products, Viscose rayon, acetate rayon , synthetic rubber with special reference to manufacture, vulcanization and reclaiming of rubber, SBR, Plastics, Thermosetting and Thermo Plastics (PVC, Polyethylene, Polyurethane, Teflon)

UNIT 5

Crude oil distillation, Thermal conversion processes (visbreaking, coking), Catalytic conversion processes (fluid catalytic cracking, catalytic reforming, hydro cracking, alkylation, isomerisation, polymerization) Finishing processes, sulphur removal process, lub oil manufacture; Petrochemicals (ethylene, propylene, formaldehyde, methanol, ethylene oxide, ethanolamine, cumene, ethylene glycol, ethyl benzene)

Text Books:

1. Dryden, C. E. ―Outlines of Chemical Technology‖ (Edited and Revised by M. Gopala Rao and M. Sittig) East West Press. Pvt. Ltd, New Delhi, 3rd Edition (1997).

2. Austin G. T. Shreve's Chemical Process Industries‖, 5th Edition, McGraw Hill (1984).

3. O P Gupta, "Chemical Process Technology", Khanna Publishing House.

Department of Chemical Engineering
(Faculty of Engineering & Technology)
P.K. University, Shivpuri (MP)
III Year Semester-V

L	T	P
3	0	0

UCOMPCH506:COMPUTATIONAL FLUID DYNAMICS

UNIT 1

Basic Concepts of Fluid Flow: Philosophy of computational fluid dynamics, conservation principles of mass, energy, and momentum, simplified flow models such as incompressible, inviscid, potential and creeping flows, classification of flows.

UNIT 2

Turbulence and its Modelling: Transition from laminar to turbulent flow, Effect of turbulence on time- averaged Navier-Stokes equations, Characteristics of simple turbulent flows, Free turbulent flows, Flat plate boundary layer and pipe flow, Turbulence models, Mixing length model, The k-e model, Reynolds stress equation models, Algebraic stress equation models.

UNIT 3

Grid Generation: Structured and unstructured grids, choice of grid, general transformation of equations, some modern developments in grid generation in solving the engineering problems.

Finite Difference Method: Discretization of ordinary and partial differential equations, approximation of first, second and mixed derivatives, implementation of boundary conditions, discretization errors, applications to the engineering problems.

UNIT 4

Finite Volume Method: Discretisation methods, approximations of surface integrals and volume integrals, interpolation and differentiation practices, implementation of boundary conditions, applications to the engineering problems. Introduction, one-dimensional steady state diffusion, two-dimensional diffusion problems, three-dimensional diffusion problems. The Finite Volume Method for Unsteady Flows and Implementation of Boundary Conditions: On e-dimensional unsteady heat conduction .

UNIT 5

Special Topics: Flow in a sudden pipe contraction / expansion, flow and heat transfer in a complex tubes and channels, reactive flow, multiphase flow, and turbulent flow processes.

Books:

1. Sengupta T. K., ―Fundamentals of Computational Fluid Dynamics‖, University Press. 2013

2. Anderson Jr J. D., ―Computational Fluid Dynamics: The Basics with Applications‖, McGraw Hill. 1995

3. Muralidhar K. and Sundararajan T., ―Computational Fluid Flow and Heat Transfer‖, Narosa Publishing House. 2003

Department of Chemical Engineering
(Faculty of Engineering & Technology)
P.K. University, Shivpuri (MP)
III Year Semester-V

L	T	P
0	0	2

UCHEMCH507:CHEMICAL REACTION ENGG LAB

1. Find out kinetic constant and study conversion of a given reaction in a batch reactor

2. Find out kinetic constant and study conversion of a given reaction in a plug flow reactor

3. Find out kinetic constant and study conversion of a given reaction in a CSTR

4. Study and operation of an adiabatic batch reactor

5. Study of a reversible reaction in a batch reactor

6. To determine energy of activation of reaction of ethyl acetate with sodium hydroxide

7. Find out specific rate contant and activation energy of a reaction in a plug flow reactor

8. To determine reaction equilibrium constant of reaction of acetic acid with ethanol.

9. To determine changes in free energy, enthalpy and entropy for the reaction of potassium iodide with iodine.

10. Study and operation of a cascade CSTR

The reaction of disappearance of phenolphthalein in NaOH solutions may be used for experiments 1,

Department of Chemical Engineering
(Faculty of Engineering & Technology)
P.K. University, Shivpuri (MP)
III Year Semester-V

L	T	P
0	0	2

UMASSCH508: MASS TRANSFER-II LAB

1. Determination of ternary curve for the system acetic acid-water-carbon tetrachloride.

2. Determination of distribution coefficient of a solute in two immiscible liquids.

3. Solid-Liquid extraction – Soxhlet's experiment.

4. Liquid - liquid extraction in packed bed.

5. Determination of adsorption kinetics and isotherm at solid-liquid interface.

6. Determination of the rate of drying in a tray dryer.

7. Estimation of efficiency of the fluidized bed dryer

Department of Chemical Engineering
(Faculty of Engineering & Technology)
P.K. University, Shivpuri (MP)
III Year Semester-V

L	T	P
0	0	2

UCHEMCH509: CHEMICAL TECHNOLOGY LAB

Preparation and Quality evaluation of following items:-

1. Cement Paint

2. Dry Distemper

3. Oil bound Distemper

4. Plastic Emulsion Paint

5. Polystyrene by Bulk Polymerization Technique

6. PMMA by Bulk Polymerization Technique

7. Transparent Soaps

8. Powdered Detergent

9. Liquid Detergent

L	T	P
0	0	2

Department of Chemical Engineering
(Faculty of Engineering & Technology)
P.K. University, Shivpuri (MP)
III Year Semester-V

USOFTCH510: SOFT COMPUTING LAB

Use of following Techniques in C/C++ Language

1. Solution of single non-linear algebraic equations by Newton Raphson method.

2. Solution of single non-linear equations by Regulafalsi method.

3. Solution of system of linear simultaneous by Gauss Elimination method.

4. Solution of system of linear simultaneous equation by gauss seidel method and successive over relaxation method.

5. Solution of single first order ordinary differential equations by fourth order Runge-Kutta method.

6. Solution of Heat equations (Parabolic equations) by finite difference method.

7. Solution of Laplace equations (elliptic equation) by finite difference method.

8. Solution of wave equations (Hyperbolic equation) by finite difference method.

9. Finding Newton's interpolatory polynomial for n points.

10. Finding Newton's interpolatory polynomial based on finite difference table for n points.

11. Simpson's 3/8-rule.

EVALUATION SCHEME
B.TECH. CHEMICAL ENGINEERING
3rd Year (6th Semester)

STUDY AND EVALUATION SCHEME FOR B.TECH IN CHEMICAL ENGINEERING

YEAR 3RD/ SEMESTER- 6TH

SUBJECT CODE	SUBJECTS NAME	STUDY SCHEME Periods/Week			Credits	MARKS IN EVALUATION SCHEME						Total Marks of Internal & External
						INTERNAL ASSESSMENT			EXTERNAL ASSESSMENT			
		L	T	P		Th	Pr	Tot	Th	Pr	Tot	
UINDUCH601	Industrial Management	3	0	0	3	30	-	30	70	-	70	100
UTRANCH602	Transport Phenomena	3	0	0	3	30	-	30	70	-	70	100
UPROCCH603	Process Dynamics & Control	3	1	0	4	30	-	30	70	-	70	100
UCHEMCH604	Chemical Reaction Engineering -II	3	0	0	3	30	-	30	70	-	70	100
UPROCCH605	Process Integration	3	1	0	4	30	-	30	70	-	70	100
UPROCCH606	Process Dynamics & Control Lab	0	0	2	1	-	25	25	-	25	25	50
UCHEMCH607	Chemical Reaction Engineering –II Lab	0	0	2	1	-	25	25	-	25	25	50
	Total	**15**	**2**	**4**	**19**	**150**	**50**	**200**	**350**	**50**	**400**	**600**

Department of Chemical Engineering
(Faculty of Engineering & Technology)
P.K. University, Shivpuri (MP)
III Year Semester-VI

L	T	P
3	0	0

UINDUCH601: INDUSTRIAL MANAGEMENT

Unit	Topic	
I	**Introduction:** Concept and scope of Industrial Management. Productivity: Definition, measurement, productivity index, types of production system, Industrial Ownership.	06
II	**Functions of Management,** Taylor's Scientific Management Theory, Fayol's Principles of Management, Social responsibilities of Management,Introduction to Human resources management: Nature of HRM, functions and importance of HRM.	06
III	**Work Study:** Introduction, definition, objectives, steps in work study, Method study: definition, objectives, steps of method study, Work Measurement: purpose, types of study — stop watch methods — steps — allowances — standard time calculations —	06
IV	work sampling, Production Planning and Control Inventory Control: Inventory, Cost, Models of inventory control: EOQ, ABC, VED	
V	**Quality Control**: statistical quality control, Control charts for variables and attributes, Acceptance Sampling- Single sampling- Double sampling plans, Introduction to TQM.	06
VI	**Project Management**: Project network analysis, CPM, PERT and Project crashing and resource Leveling	06

References:
1. Engineering Management (Industrial Engineering & Management)/ S.C. Sharma & T.R. Banga, Khanna Book Publishing Co. (P) Ltd., Delhi (ISBN: 978-93-86173-072)
2. Industrial Engineering and Management/ P. Khanna, Dhanpatrai publications Ltd.
3. Production & Operation Management /PaneerSelvam /PHI.
4. Industrial Engineering Management/NVS Raju/Cengage Learning.
5. Industrial Engineering Management I RaviShankar/ Galgotia.

L	T	P
3	0	0

UTRANCH602: TRANSPORT PHENOMENA

UNIT 1

Vectors/Tensors, Newton's law of viscosity, Temperature, pressure and composition dependence of viscosity, Kinetic theory of viscosity, Fourier's law of heat conduction, Temperature, pressure and composition dependence of thermal conductivity, Kinetic theory of thermal conductivity, Fick's law of diffusion, Temperature, pressure and composition dependence of diffusivity, Kinetic theory of diffusivity.

UNIT 2

Shell Momentum balances, velocity profiles, average velocity, momentum flux at the surfaces, Equations of Change (Isothermal), equation of continuity, equation of motion, equation of energy (isothermal).

UNIT 3

Shell energy balances, temperature profiles, average temperature, energy fluxes at surfaces, Equations of change (non-isothermal), equation of continuity, equation of motion for forced and free convection, equation of energy (non- isothermal).

UNIT 4

Shell mass balances, concentration profiles, average concentration, mass flux at surfaces, Equations of change (multi-component), equations of continuity for each species, equation of energy (multi-component).

UNIT 5

Introduction to the concept of heat and mass transfer coefficients. Interphase mass transfer, various coefficient of mass transfer and their determination, resistance concept, controlling phase concept, Mass transfer in turbulent flow, Analogies of mass transfer, Empirical equations. Theories of mass transfer, two film theory, Higbies penetration theory, Derivation of flux equation, surface renewal theory.

Text Book:

1. Byron, R. B., Stewart, W. E., Lightfoot, E. N., ―Transport Phenomena‖, John Wiley & Sons,1960.

L	T	P
3	1	0

Department of Chemical Engineering
(Faculty of Engineering & Technology)
P.K. University, Shivpuri (MP)
III Year Semester-VI

UPROCCH603: PROCESS DYNAMICS & CONTROL

UNIT 1

Dynamic modeling of first and second-order process; Interacting and non-interacting processes; Nonlinear and integrating processes; introduction to non-minimum phase processes; Distributed parameter processes and MIMO processes; Response of first and second order processes with respect to different types of forcing functions.

UNIT 2

Experimental estimation of dynamic process parameters and identification. Modes of control action:

Classification of controllers and control strategy.

UNIT 3

Closed loop feedback control: Servo and regulator problems; Offset; Selection of mode of control action; Closed loop response;

UNIT 4

Routh stability criterion; Controller tuning and design:, Online tuning- closed loop and open loop methods. Frequency response technique: Phase margin and gain margin; Bode stability criterion; Nyquist stability criterion; Controller design. Root locus plot and stability analysis.

UNIT 5

Cascade and feed forward control: Design of controller and analysis of control system. Ratio, Adaptive, Model-based, Multivariable, Selective and Split range control. Computer process control

Text Book:

1. Coughnaowr, D. R., ―Process Systems Analysis and Control‖, McGraw-Hill, Inc.
2. Stephanopolous, G., ―Chemical Process Control‖, Prentice-Hall.

Reference Books:

1. Seborg, D. E., Edgar, T., and Mellichamp, D. A., ―Process Dynamics and Control‖, John Wiley and Sons.
2. Bequette, B. W., ―Process Control: Modeling, Design, and Simulation‖, Prentice-Hall, Inc.
3. Chidambaram, M., ―Computer Control of Processes‖ Narosa Publishing House Pvt. Ltd., Ind.
4. D.C. Sikdar, " Instrumentation and Process Control", Khanna Book Publishing

L	T	P
3	0	0

Department of Chemical Engineering
(Faculty of Engineering & Technology)
P.K. University, Shivpuri (MP)
III Year Semester-VI

UCHEM604: CHEMICAL REACTION ENGINEERING -II

UNIT 1

Introduction to heterogeneous reactions, rate equation for surface kinetics, pore diffusion resistance combined with surface kinetics, Fluid-fluid reactions: kinetics and design.

UNIT 2

Fluid-solid reactions, experimental methods for finding rates, selection of a model, shrinking-core model for spherical particles of unchanging size, rate of reaction for shrinking spherical particles, determination of rate controlling step, kinetic and design, Design of packed bed and fluidized bed reactors.

UNIT 3

Nature of catalysis, Determination of surface area, void volume and solid density, pore- volume distribution, physical and chemical adsorption, adsorption isotherms, Physical properties of catalysts, preparation, testing and characterization of solid catalysts, catalyst selection, catalyst preparation, promoters and inhibitors, catalyst poisoning and mechanisms of catalytic reactions, catalyst deactivation.

UNIT 4

Reaction and diffusion within porous catalysts, effectiveness factor, various resistances to transfer of reactants to the catalyst site, intrinsic and global rate of reaction, kinetic regimes, heat effects during reaction, Performance equations for reactors containing porus catalyst particles, design of solid catalytic reactors.

UNIT 5

Biochemical reactors, polymerization reactors.

Books:

1. Smith, J, M, ―Chemical Engineering Kinetics‖, 3rd Edition, McGraw-Hill (1990).
2. Levenspiel, O., ―Chemical Reaction Engineering‖, 3rd Edition, John Wiley, (1998).
   Reference Books:
1. Daizo Kunii & Octave Levenspiel, ―Fluidization Engineering‖ 2nd Edition, Elsevier (India Print 2005)
   2.. Coulson and Richardson's Chemical Engineering Volume 3 - Chemical and Biochemical Reactors and Process Control (3rd Edition)

L	T	P
3	1	0

Department of Chemical Engineering
(Faculty of Engineering & Technology)
P.K. University, Shivpuri (MP)
III Year Semester-VI

UPROCCH605: PROCESS INTEGRATION

UNIT 1

Process Integration and its Building Blocks: Definition of Process Integration (PI), Areas of application and Techniques available for Process Integration, Role of thermodynamic laws.

UNIT 2

Basic Elements of Pinch Technology: Data extraction, Targeting, Designing,Grid diagram, Composite curve, Problem table algorithm, Grand composite curve.

UNIT 3

Targeting of Heat Exchanger Network (HEN): Energy targeting, Area targeting, Number of units targeting, Shell targeting, cost targeting.

UNIT 4

Designing of HEN: Pinch design methods, Heuristic rules, Stream splitting, Design of maximum energy recovery (MER), Design of multiple utilities and pinches.

UNIT 5

Heat Integration of Equipments: Heat engine, Heat pump, Distillation column, Reactor, Evaporator, Drier, Refrigeration systems.

Books:

1. Linnhoff, B. Townsend D.W., Boland D., Hewitt G.F., Thomas, B.E.A., Guy, A. R. and Marsland, R. H., ―A User's guide on process integration for the efficient use of energy‖, Inst. of Chemical Engineers, London (1982).
2. V. Uday Sheno, Heat Exchanger network synthesis, Gulf Publishing Co, USA, 1995
3. James M. Douglas Conceptual Design of Chemical Process, McGraw Hill, New York, 1988.
4. Smith, R., ―Chemical Process Design‖, McGraw Hill (1995).

Department of Chemical Engineering
(Faculty of Engineering & Technology)
P.K. University, Shivpuri (MP)
III Year Semester-VI

L	T	P
0	0	2

UPROCCH606: PROCESS DYNAMICS & CONTROL LAB

1. Transient response to single tank system with storage & Flow to (a) step change (b) impulse change in put.

2. Transient response of non-interacting system in series.

3. Transient response of interacting system in series.

4. Study the operation of ON-OFF electronic temperature controller & determination of its performance to control the temperature of a system having capacity to store thermal energy.

5. Study the principle of operation & working of pneumatic servo system with various input functions.

6. Transient response of a CSTR System to step change.

7. Controlling a batch reactor using digital PID controller.

8. Study the dynamics of parallel & counter flow shell & tube heat exchanger.

9. Controlling of Parallel Flow & counter flow STHE using digital PI controller to have desired output.

10. Dynamics characteristics of mercury & water manometers.

11. Study of control value characteristics.

L	T	P
0	0	2

UCHEM607: CHEMICAL REACTION ENGINEERING –II LAB

1. Study and operation Trickle bed reactor

2. Study and operation Condensation polymerization reactor

3. Study and operation Emulsion polymerization reactor

4. RTD study in a CSTR

5. RTD study in a plug flow reactor

6. Study and operation of a coiled tubular reactor

7. Study of heterogeneous catalytic reactor

8. Determination of porosity and pore volume of a substance. (kieselguhr, alkaline earth or alumina may be used as substance)

9. To study toluene hydrogenation over Raney nickel catalyst

10. To study acetaldehyde decomposition over copper gauze catalyst