

VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT
SCHEME OF TEACHING AND EXAMINATION BE –IV

(CHEMICAL ENGG) SEMESTER – 7

Course No.	Course	Teaching Scheme			Examination Scheme				Total Marks
		Theory	Tutoria	Practical	Theory	Practical	TW	Tut.	
CH701	Transport Phenomena	3	0	0	100	30	20	25	175
CH702	C.R.E.-II	3	0	2	100	30	20	-	150
CH703	P.E.D.D.	3	0	3	100	60	40	25	225
CH704	Process Control	3	0	2					
CH705	Seminar	0	0	2	-	50	-	-	50
CH706	Project Preliminaries	0	0	3	-	50	-	-	50
CH707	Training	0	0	2	-	100	-	-	100
	Total	12	02	14					900

VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT
TRANSPORT PHENOMENA

SEMESTER –VII

TEACHING SCHEME

L=3; P/D=0; TA=0

EXAMINATION SCHEME

Theory = 3hours; Marks= 100

- 1. Transport by molecular motion:** review of momentum, energy and mass transport by molecular motion.
 - Newton's law of viscosity - Non-newtonian fluids press. and temperature depending on viscosity - viscosity of liquids - Fouriers' law - Temperature and pressure depending of thermal conductivity in gases and liquids - Thermal conductivity of liquids and solids .- Fick's law - Temperature and pressure dependence - diffusion in liquids.
- 2. Transport in laminar one dimensional flow**
 - shell and momentum balances - falling film flow through circular tube and annulus
 - Heat conduction with electrical heat source - Viscous heat source - Forced and Natural convection - Diffusion through stagnant gas film. - with homogenous chemical reaction - Forced convection mass transfer .
- 3. Transport in arbitrary continuum**
 - Equation of continuity - motion and mechanical energy - equation of change for Incompressible non-Newtonian flow - Dimensional analysis of the equilibrium change.
- 4. Transport with two independent variables**
 - Unsteady viscous flow - steady viscous flow two dimensional potential flow - Boundary layer theory.
- 5. Transport in turbulent flow**
 - Time smoothed quantities - for incompressible fluids - expression for the Reynold stresses - Time smoothed temperature - energy equation - Turbulent energy flux - Concentration.fluctuations. - equation of continuity of Turbulent mass flux.
- 6. Transport between two phases**
 - Friction factors - flow in tubes - Flow around spheres - packed column - heat transfer coefficients for forced convection in tubes - Forced convection thorough packed beds. - free convection - mass transfer coefficient in one phase - Binary mass transfer coefficient in two phases.
- 7. Transport to layer flow systems.**
 - Macroscope balance - mechanical energy balance - estimation of friction loss - steady flow problems - steady flow problems - unsteady flow.

REFERENCES:

1. R.B. Bird, W.E. Stewart & F.W. Lightfoot, "Transport phenomena", John Wiley & Sons, 1960.
2. D.D. Holland, 'Multicomponent distillation', Prentice Hall India.
3. T.K. Sherwood and R.L. Pigford. "Absorption and Extraction", McGraw Hill company 1952.

VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT
CHEMICAL REACTION ENGG. -II

SEMESTER -VII

TEACHING SCHEME

L=3; P/D=2; TA=0

EXAMINATION SCHEME

Theory = 3hours; Marks= 100

PRACTICAL / DRAWING

Internal evaluation Marks: 20

External evaluation Marks: 30

Total Marks: 50

1. Non- ideal fluids
2. Mixing of fluids
3. Kinetics & design for uncatalyzed heterogenous system
4. Fluid - Fluid reactions
5. Fluid particles reactions
6. Catalysis
7. Porous catalysis
8. Deactivating catalysis
9. Solid catalyzed reactions
10. Fixed bed reactors,
11. Slurry reactors
12. Fluid bed reactors
13. Optimization
14. Industrial applications

REFERENCES:

1. Octave Levenspeil, 'Chemical Reaction Engg.', 2nd ed.1995,John-Wiley
2. J.M. Smith , 'Chemical Engg. Kinetics', 3rd ed. 1981, McGraw Hill Co., New York.
1. S.M.Walas, 'Reaction kinetics for Chemical Engg.'published in 1959 McGraw Hill Co., New york.
2. Fogler Scott II."Elements of Chemical Reaction Engineering".Prentice hall of India Pvt. Ltd., 1997
3. Perry Robert H. Green Don W. "Perry's Chemical Engineer's Handbook", McGrawhill,1984

VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT
PROCESS EQUIPMENT DESIGN & DRAWING

SEMESTER –VII

TEACHING SCHEME	L=3; P/D=4; TA=1
EXAMINATION SCHEME	Theory = 3hours; Marks= 100
PRACTICAL / DRAWING	Internal evaluation Marks: - 40 External evaluation Marks – 60 Tutorial = 25 Total Marks - 125

DESIGN:

- 1] Basic consideration of mechanical design of process equipments, selection of type of vessel
- 2] Criteria in vessel design.
- 3] Design of pressure vessels under internal pressure, constructional features, pressure vessel code, design of shell, types of heads for pressure vessel, design of thickness of heads.
- 4] Design of storage vessel, storage of nonvolatile and volatile liquids and gases. Codes for storage vessel design, bottom and shell designs.
- 5] Design of vessels under external pressure of vacuum stress analysis, use of stiffeners, design of shell analytical and graphical methods, design of circumferential stiffeners, design of covers, pipes and tubings under external pressure.
- 6] Design of distillation and fractionation column.
- 7] Design of heat exchangers, shell and tube exchangers, tube sheet channels, shell joints, baffles, tie rods, expansion provisions.
- 8] Design and construction of reaction vessels, evaporators, crystallizers, dryers, filters.
- 9] Supports for Vessels, types of brackets or leg support, skirt support, Saddle supports, design considerations.
- 10] Process hazards & Safety, measures in equipment design analysis of hazards, pressure relief devices.

DRAWING

- 1] Drawing based on actual design of selected process equipment, such as pressure vessels, storage vessels, heat exchangers, distillation columns, reaction vessels, crystallizers, absorbers, dryers etc.
- 2] Sketches of equipment accessories such as supports, roofs for storage vessel, jackets, cooling coils, tube sheet for heat exchangers, baffles in heat exchangers, trays for distillation column, packing for distillation towers, liquid distributor etc.

TUTORIAL:

Continuous internal evaluation based on above topics along with assignments.

REFERENCE:

- 1] M.V.Joshi , ‘ Process Equipment Design’ , McMillan Co., India, 1976.
- 2] L.E. Brown, E.H. Young, ‘Process Equipment Design’ Wiley Eastern Ltd., New Delhi, 1977.
- 3] E.E. Ludwig, ‘ Applied Process Design for Chemical and Petrochemical Plants- Vol. I, II, III’ , Gulf Publishing Co.
- 4] J.M. Douglas, ‘ Conceptual Design of Chemical Processes’ , MGH.
- 5] Kern Donald Q. “Process Heat Transfer”, Mcgrawhill, 1997.
- 6] Bhattacharya B.C. “Introduction to Chemical Equipment Design Mech Aspects”, CBS Publishers, 2000.

VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT
PROCESS CONTROL

SEMESTER –VII

TEACHING SCHEME
EXAMINATION SCHEME

L=3; P/D=2; TA=0
Theory = 3hours; marks= 100

PRACTICAL / DRAWING

Internal evaluation Marks: - 20
External evaluation Marks - 30
Total Marks - 50

1. Introduction: Steady and unsteady state design equation for an agitated heated tank. Introduction to P,PI, PID controls.
2. Dynamics of first order systems subjected to various disturbances like step, ramp, impulse & sinusoidal, eg. liquid level tanks, mixing process, thermometer etc.,response of first order systems in series.
3. Dynamics of second order systems subjected to various disturbances like step, impulse, sinusoidal.
4. Linear closed loop systems, servo and regulator problem.
5. Closed loop transfer functions, block diagrams for various simple systems. Transient response of a control system.System compensation.
6. Stability of control system. Routh test criterion. Frequency analysis, simple order systems, Bode diagrams.Nyquist stability criterion.
7. Advanced controls like feed forward, case and ratio controls.
8. Controller and control elements, control valves.

REFERENCE:

1. Coughanowr, "Process Systems and control", 2nd edition, 1991, Mcgraw Hill co NY
2. Kopell & Coughanowr, "Process system" published 1965, Mcgraw Hill co NY
3. Shinshey F.G. "Process Control system" 2nd edi. 1979 McGraw Hill company, New York.

**VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT
SEMINAR**

SEMESTER –VII

VIVA = 50

Under the above subject each student will be assigned one topic related to Chemical Engg. field by the concerned staff member. The student will make an up-to-date **literature survey / research oriented experimental work / design of (equipment / plant / system) / modeling and simulation of any system** with reference to the topic assign to him/her under the supervision of the concerned staff member & submit two copies of the report. He/she will present **material / literature / assigned work** in the form of a paper by giving a talk to be followed by discussion. The copies of the report submitted by him/her will be evaluated as term work followed by **Viva-Voce of each student.**

VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT
PROJECT PRELIMINARIES

SEMESTER –VII

Marks: 50

- Each student is required to submit Project report **on the designing of Chemical Plant/ exhaustive research oriented experimental work / exhaustive design work / modeling and simulation of any system / exhaustive work on industrial problem.** The report will consist of important Chapters(with reference to the assigned topics) – for example on the designing of chemical plant - such as the follows.

- 1] Introduction
- 2] Literature Survey
- 3] Selection of the Process & process details with Justification
- 4] Thermodynamic & kinetics consideration
- 5] Physico-Chemical data & properties
- 6] Material Balance with flowsheet

The copies of the report submitted by him/her will be evaluated as term work followed by **Vice – voce of each student.**

VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT TRAINING

Total Marks: 100

Each student is required to undergo practical training in a **Chemical Industry / R & D organization** for Four to Six weeks & has to prepare a report covering the following aspects.

- 1] Introduction of the Industry. (Company Profile)
- 2] Process description & flow sheet. (Details about the process)
- 3] Details of equipment- Data sheet, types of the equipment, material of construction, internals.
- 4] Process utilities
- 5] Material Storage & handling
- 6] Instrumentation & Process control
- 7] Safety & environmental aspects.
- 8] Conclusion.

The copies of the report submitted by him/her will be evaluated as term work followed by **Vice – voce of each student.**