VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT

SCHEME OF TEACHING AND EXAMINATION B.E. - IV

(CHEMICAL ENGG)

SEMESTER – VIII

Course No.	Course	Teaching Scheme			Examination Scheme				Total Marks
		Theory	Tut.	Pract.	Theory	Prac./viva	TW	Tut.	
CH801	C.E.P.D.E	3	0	0	100	0	0	0	100
CH802	Safety & waste Management	3	0	2	100	30	20	0	150
CH803	CAD in Chemical	3	2	2	100	30	20	50	200
CH804	Elective - I	3	1	0	100	0	0	25	125
CH805	Elective -II	3	1	0	100	0	0	25	125
CH806	Project	0	0	8	0	200	0	0	200
	Total	**15**	**4**	**12**					**900**

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SEMESTER – VIII

CHEMICAL ENGG PLANT DESIGN AND ECONOMICS

TEACHING SCHEME **L=3; P/D=0; TA=0**

EXAMINATION SCHEME **Theory = 3hours; Marks= 100**

1. Introduction, basic consideration in chemical engg. Plant design, project identification, preliminary techno economic feasibility.
2. Process design aspects, selection of process, factors affecting process selection, types of flow diagrams.
3. Selection of process equipments, standard versus special equipment, materials of construction. selection criteria etc
4. Process auxiliaries, piping design, layout, support for piping insulation, type of valves process control and instrumentation control system design.
5. Process utilities, process water, boiler feed water, water treatment and disposal,steam, oil heating system, chilling plant compresed air and vacuum.
6. Plant location and layout, principles, factors affecting plant location, use of scale models.
7. Cost estimation, factors involved in project cost estimation.,total fixed & working capital, types & methods of estimation of total capital investment.
8. Estimation of total product cost, factors involved.
9. Depreciation, types and methods of determinations, evaluation.
10. Profitability, alternative investment & replacement methods for profitability evaluation
11. Economic considerations in process and equipment design, inventory control.
12. Optimum design, general products rates in plant operation,optimum conditions.etc.

REFERENCE:

1. M.S. Peters & K.D. Timmerhaus, "Plant design &Economics for Chemical engineers", McGraw Hill (Japan) 2nd Edition., 1968
2. F.C. Vilbrandt & C.E. Dryden, "chemical Engineering plant design" McGraw Hill (New York), 4th Edition.1959.

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SEMESTER – VIII

SAFETY AND WASTE MANAGEMENT

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. Types of hazards in chemical industries, Hazards due to high pressure and explosions, dust and vapour cloud explosions, inflammable materials, toxic materials, electrostatics, ionising radiations etc.
2. Noise hazards, Effect of noise hazard on personal, plant operation.
3. Fire and explosion indices and hazard analysis.
4. Safety protection, equipments for personal and plant, various hazards.Safety procedures.
5. Disaster management, insurance, worker's safety Act etc.
6. Sources and effects of environmental pollution.

- Air Pollution : Sources and effects materiological aspects of air pollutant dispersion, air pollution sampling and measurment, air polluiton control methods and equipment, control of specific gaseous pollutants.
- Water Pollution : Origin of waste water and waste water flow rate, Waste water characteristics, Waste water sampling , methods of analysis and water quality standards, Waste water treatment.
- Land Pollution (Solid waste): Sources and classification, methods of collection and disposal.

7. Management of industrial waste reuse, recycling, impact of pollution on environment and it's assessment.
8. Magnitude of industrial waste problem, effluent standards and stream standard.
9. Environmental legislation.

PRACTICALS:

1. To determine : COD/TOC, TDS/SS, Ammonical nitrogen, Chlorides, Phosphates, Sulfates, Sulfur, Hardness, Acidity/Alkalinity, Organic/Inorganic matter, Cynide, Colour, Phenol.
2. Gypsum sludge : Leachate in acetic acid and distilled water, Moisture, Organic/Inorganic matter.
3. To study BOD, AAS, Heavy metals analysis.
4. To study stack analysis.

REFERENCES :

1. C. S. Rao, Environmental and pollution control engineering, Wiley eastern limited
2. Metcalf and Eddy, Waste water engineering: treatment, disposal and reuse, Tata McGraw Hill
3. Introduction to Environmental Engineering by Mackenzie I Devis, David A Croswell 1991, McGraw Hill International.
4. Environmental Engineering By Rao, Peony and Tehobanoglolus.
5. Chemistry for Environmental Engineering - Sawyer and Me Carty, 3rd edition, International student edition, McGraw Hill company.
6. Standard method for water Analysis by Met calf and Eddy.

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SEMESTER – VIII

CAD IN CHEMICAL ENGINEERING

TEACHING SCHEME	**L=3; P/D=2; TA=2**
EXAMINATION SCHEME	**Theory = 3hours; marks= 100**
PRACTICAL / DRAWING	**Internal evaluation Marks: 20** **External evaluation marks: 30** **Tutorial: 50** **Total Marks: 100**

1. Introduction to CAD.
2. Elementary ideas of numerical techniques such as finite difference & finite element methods applied to chem. Engg. Problems.
3. Computer aided design of chemical process equipments, concept of modular design, optimum design, parameter optimization etc., development of simple algorithms for problems related to above topics.

PRACTICALS:

Development of Simple Programmes based on above topics.

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.
7. Balarurusamy E “Object Oriented Programming with C++”, Mcgrawhill, 2002.

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SEMESTER – VIII

CH 804 A : ELECTIVE 1:Multi Component Distillation

TEACHING SCHEME **L=3; P/D=0; TA=1**

EXAMINATION SCHEME **Theory = 3hours; Marks= 100**
Tutorial = 25

1. Fundamental Concepts Involved in Multi-Component Distillation
2. Calculations for Bubble Point and Dew Point Temperatures
3. Equilibrium Data
4. Thermodynamics of Vapor Liquid Equilibrium
   - The first and Second Laws of Thermodynamics
   - Ideal and Non Ideal solutions
   - Lewis and Randall Rule for Vapor and Liquid
   - Physical Equilibrium
   - Relation between Enthalpy to Fugacity and Acitivity
   - Excess Free Energy
5. Correlation of Vapor Liquid Equilibrium
   - Method of Lewis and Kay
   - Method of Souders, Selheimer and Brown
   - Method of Gamson and Watson
   - The Kellog Charts
6. Material Balance
7. Enthalpy Balance
8. Case Studies

Reference:

1. Unit Operations, Brown Geroge and Associates, 1st Edition, CBS Publishers and Distributors, New Delhi – 1995.
2. Chemical Engineering, Coulson J. M., Richardson J. F., Volume II, 3rd Edition, Pergamon Press, Oxford 1978
3. Multi-Component Distillation, Holland Charles D., Prentice Hall Inc, Englewood Cliffs N.J., U.S. A. 1963.

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SEMESTER – VIII

CH 804 B : ELECTIVE I: ENVIRONMENTAL ENGINEERING

TEACHING SCHEME	**L=3; P/D=0; TA=1**
EXAMINATION SCHEME	**Theory = 3hours; Marks= 100** **Tutorial = 25**

SYLLABUS

1. Environmental Engineering aspects of air, water and solid pollution
2. Waste Treatment Plant Design
3. Ecology and diversity
4. Environmental Impact Assessment
5. ISO 14000 Certification & Environmental Laws
6. Environment Audit and Case studies

RECOMMENDED BOOKS

1. Gilbert Masters, Introduction to environmental engineering & science, Prentice Hall, 1991.
2. C. S. Rao, Environmental and pollution control engineering, Wiley Eastern Limited, 1991.
3. Metcalf and Eddy, Waste water engineering: treatment, disposal and reuse, Tata McGraw Hill, IIIrd 2000/ IVth ed. 2003.
4. S.M. Khopkar, Environmental pollution monitoring and control, New Age International Publishers, 2004.
5. R.K. Trivedy, Industry and Environment, Daya Publishing House, Delhi, 2002.
6. Internet resources and Journals

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SEMESTER – VIII

Elective – I 804 C- (FERTILIZER TECHNOLOGY)

TEACHING SCHEME	**L=3; P/D=0; TA=1**
EXAMINATION SCHEME	**Theory = 3hours; Marks= 100**
	Tutorial = 25

Following aspects to be addressed to for various fertilizers and their intermediates such as Ammonia, Urea, Ammonium Sulfate, etc.

1] Present technologies available for the production, their technical along with energy consumption.

2] Operating conditions and unit operations involved.

3] Catalysis of process.

4] Instrumentation and process control.

5] Materials of construction and typical engineering problems.

6] Simulation and Optimization of the process.

7] Considerations for plant lay-out.

8] Economics of production.

9] Storage, handling, and transportation.

10] Hazop and Risk analysis study of the process.

11] Environmental aspects

TUTORIAL:

Continuous internal evoluation based on above topics alongwith assignments.

REFERENCES:

1] Dryden “Outlines of Chemical Technology” by Gopal Rao 3rd edition, 1997 Estern Wiley Publication.

2] Austin & Shreve “Chemical Process Industries” 5th edition 1984, McGraw Hill Co.

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SEMESTER – VIII

CH 805 A : ELECTIVE I1:BIOCHEMICAL ENGINEERING

TEACHING SCHEME	**L=3; P/D=0; TA=1**
EXAMINATION SCHEME	**Theory = 3hours; Marks= 100** **Tutorial = 25**

Syllabus

1. Cell Structure and Cell types, Chemicals of life (RNA, DNA, enzymes etc.)
2. Principles of biochemical reaction kinetics
3. Mass and energy balance in biological system, Transport phenomena, Enzymatic reaction kinetics
4. Free and immobilised enzyme cell systems
5. Microbial growth and product formation kinetics
6. Classification, design and analysis of bioreactors
7. Upstream processing - media and air sterilisation, Downstream bioprocessing
8. Interaction of Mixed Microbial Populations
9. Physical separation processes, Chromatography; Membrane processes
10. Biological Wastewater Treatment
11. Modern Biotechnological applications

References:

1. Bailey, James E.; Ollis, David F. “Biochemical engineering fundamentals” McGraw-Hill, 1986.
2. Aiba, Shuichi; Humphrey, Arthur E.; Millis, Nancy F. “Biochemical engineering” Academic Press N.Y.
3. Blanch, Harvey W.; Clark, Douglas S. “Biochemical engineering” Marcel Dekker, N.Y.

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SEMESTER – VIII

CH 805 B: ELECTIVE – II : Energy Conservation

TEACHING SCHEME	**L=3; P/D=0; TA=1**
EXAMINATION SCHEME	**Theory = 3hours; Marks= 100** **Tutorial = 25**

1. Introduction- energy, types, resources, demand and supply
2. Need and opportunities to conserve energy
3. General strategies for energy savings
4. Equipments for energy conservation
5. Materials for saving energy
6. Non-conventional energy sources
7. Alternative fuel development
8. Energy audit and case studies

References:

1. S. Rao and B.B. Parulekar, Energy technology: non-conventional, renewable and conventional, Khanna Publisher, 1997.
2. Guide book for national certification examination for energy managers and energy auditors, General aspects of energy management and energy audit. Bureu of Energy Efficiency (A statutory board under Ministry of Power, Government of India), 2005.
3. Guide book for national certification examination for energy managers and energy auditors, Energy efficiency in thermal utilities. Bureu of Energy Efficiency (A statutory board under Ministry of Power, Government of India), 2005.
4. Guide book for national certification examination for energy managers and energy auditors, Energy performance assessment for equipment and utility systems.

Bureu of Energy Efficiency (A statutory board under Ministry of Power, Government of India), 2005.

5. Internet resources and Journals

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SEMESTER – VIII

ELECTIVE- II 805 C (PETROLEUM REFINING AND PETROCHEMICALS)

TEACHING SCHEME	**L=3; P/D=0; TA=1**
EXAMINATION SCHEME	**Theory = 3hours; marks= 100**
	Tutorial = 25

1. Oil fields and Refineries in India- Indian petroleum Industry, crude and gas reserves, refining picture.
2. Types of Crudes- composition, classification of petroleum.
3. Evaluation of oil stocks and Refinery Products- TBP distillation, ASTM distillation, equilibrium flash vaporization, interconversion of boiling points, refinery products.
4. Properties of crudes and products- Thermal properties, Test for various refinery products.
5. Processing of petroleum- Atmospheric distillation, Vaccum Distillation, various ways of operating distillation columns.
6. Treatment techniques-impurities, treatment of LPG, Gasoline, Kerosene and Lubes, Wax and purification.
7. Petrochemical Industry-Classification, Chemicals form C1, C2, C3, C4 compounds, chemicals from aromatics, Petrochemicals from various unit processes like oxidation, chlorination, alkylation etc., recent developments in the manufacturing processes.

TUTORIAL:

Continuous internal evaluation based on above topics along with assignments.

REFERENCE:

1. B.K. Rao, ‘Modern Petroleum Refinery Process’, Oxford-IBH Publishing Co.(1990).
2. Nelson, ‘Petroleum Refinery Engineering’, MGH.
3. Introduction to Petrochemical by su kumar Hain, Oxford - IBH Publishing company - 1992.
4. Chemistry and Technology of Petroleum's Refining by J.G. Speight, Mercel Dekka.

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SEMESTER – VIII

PROJECT

Marks= 200

- 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
7] Energy Balance with flowsheet
8] Process design & various equipments & optimum operation condition.
9] Fabrication drawing of one of the major equipment with all relavant necessary details.
10] Other important consideration such as instrument & process control, plant layout, safety precuation etc.
11] Environmental aspects.
12] Cost estimation
13] Conclusion.
14] Bivliograpy & refrences.

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