University School of Chemical Technology
Guru Gobind Singh Indraprastha University

Syllabus of Examination

B.Tech/M.Tech Dual Degree (Chemical Engineering)

(7th Semester)

(w.e.f. August 2004 Batch)

SCHEME OF EXAMINATION
B.TECH/M.TECH DUAL DEGREE (CHEMICAL ENGINEERING)

L	T	P	Credit
14	**4**	**11**	**25**

SEVENTH SEMESTER SCHEME

Code No.	Paper	L	T	P	Credits
Theory Papers					
14401 CT-401	**Process Equipment Design**	**2**	**2**	**0**	**4**
14303 CT-403	**CAD and Simulation**	**3**	**1**	**0**	**4**
14405 CT-405	**Introduction to Biochemical Engg.**	**3**	**1**	**0**	**4**
98411 HS-411	**Introduction to Economics**	**3**	**0**	**0**	**3**
	Elective-I/IDS	**3**	**0**	**0**	**3**
Practical/Viva Voce					
14451 CT-451	**CAD & Simulation Lab**	**0**	**0**	**3**	**2**
14453 CT-453	**Project Work I**	**0**	**0**	**8**	**4**
14455 CT-455	**Industrial Training / Visit Report**	**-**	**-**	**-**	**1**
Total		**14**	**4**	**11**	**25**

CT-401 Process Equipment Design

L	T	P	Credits
2	2	0	4

Introduction to various codes (ASTM, API, Japanese, German etc.) used in chemical process industries and their application.
Basic Engineering design approach and selection of pressure vessel components such as Head, closure, flanges, gasket, nozzles etc, Design of process vessel support Mechanical design of process equipment such as pressure vessel, shell & tube Heat Exchanger, plate and packed tower, reactors. Material specification.

Books & References :

1. Introduction to Chemical Equipment Design, Mechanical Aspects, Bhattacharya, B.C., CBS Publisher and Distributor, Ist Edition 1985.
2. Process Equipment Design, Joshi, M.V.,Mahajani,V.V., Macmillan India Ltd, 3rd Ed, 1996.
3. Parry's Chemical Engineer's Hand Book, Robert H.Parry, Don W.Green, McGraw Hill, 7th Ed., 1998.
4. Plant Design and Economics for Chemical Engineers Max S.Peters, Klaus D. Timmerhaus McGraw Hill., 4th 1991.
5. Chemical Process Equipments selection and design, Stanley M.Walas, Butterworth Heinemann, Ist Ed., 1990.

CT-403 CAD and Simulation

L	T	P	Credits
3	1	0	4

Mathematical Modelling: Basis of mathematical model, types of mathematical model, fundamental laws of modeling, model building, modelling difficulties, differential and population balance models, use and importance of mathematical models in process design.

Fundamental laws: Continuity equations, energy equations, equation of state, equilibrium, & Chemical Kinetics.

Simple examples of process models ie reactors (plug flow, CSTR, Batch etc.), mass transfer equipments (distillation column, humidifier, dehumidifiers, absorber etc.), heat transfer equipments (evaporators, condensers, heat exchanger etc), crystalliser etc and their combinations.

Application of numerical methods in digital simulation: Interactive convergence methods, interval halving, Newton raphson method, false position, explicit convergence method, wegstein method, muller method, numerical integration of ordinary differential equations; explicit numerical integration algorithms, euler method, runga-kutta method, implicit method

Process flow simulation: Steady state simulation, concept of unit computation, block diagrams development, signal flow graph, partition, tearing convergence block and control block concept, process matrices, identification of recycle sets through process matrices.

Use of generic software for steady state material and energy balance flow sheet simulation. Review of thermodynamics, Correlation for estimates of physical properties of liquid/gaseous mixture like phase equilibrium, bubble point, dew point.

Software development for design of chemical engineering equipments

Books & References:

1. Luyben, W.L. Process Modelling, Simulation and Control, McGraw Hill Book Co., 1990.
2. Franks, R.G.E., Modelling and Simulation in Chemical Engineering, Wiley Inter Science.
3. Hussain Asgher, Chemical Process Simulation, Wiley Eastern Ltd., New Delhi, 1986.

CT-405 Introduction to Bio-chemical Engineering

L	T	P	Credits
3	1	0	4

Enzyme & Kinetics of Enzyme-Catalytic Reactions

Enzyme - Basic knowledge, Physico-chemical properties, Micro-organism as a source of enzyme.

Enzyme Kinetics - Single & double substrate steady state kinetics, effect of pH & temperature, inhibition. Down stream processing of commercial enzymes. Enzyme purification techniques.

Bioprocess Engineering

Microbial growth in a batch and continuous bioreactor; substrate utilization and product formation kinetics. Estimation of cell mass; Study of different phase of microbial growth, concept of limiting nutrient and effect of its concentration on cell growth; Study of growth inhibition kinetics, study of product formation kinetics in a fermentation process; comparison between aerobic and anaerobic bioconversion process; estimation of K_La in fermentation process.

Air Sterilization; Media Sterilization; Batch, continuous and fed batch processes Aeration and agitation.

Books & References:

1. Biochemical Engineering Fundamentals by James E.Bailey & David F.Ollis, McGrew-Hill.
2. Bioprocess Engineering by Shuler & Kargi, Prentice Hall
3. Encyclopedia of Chemical Engineering by Kirk & Othmer,

CT-451 CAD & Simulation Lab

L	T	P	Credits
0	0	3	2

Application of the following software packages to assigned problems:

1. ASPEN PLUS
2. ASPEN DYNAMICS
3. ASPEN CUSTOMER MODELER
4. MATLAB-SIMULINK

CT-453 Project Work I

L	T	P	Credits
0	0	8	4

Each student shall be assigned a specific project. He/she shall select most appropriate process from various available alternatives and design the plant. A cost analysis, plant layout etc. may also form part of the total exercise. The final report will be examined by a panel. Experimental projects with well defined aims may also be offered subject to the availability of facilities.

CT-455 Industrial Training / Visit Report

L	T	P	Credits
0	0	0	1

Student should obtain training in assigned chemical industry for a period of six to seven weeks in summer and get acquainted with operation of commercial scale plants. The trainee should familiarize himself/herself with all aspects such as purchase, quality control, operation and maintenance, R&D, finishing and packaging etc.

At the end of the training period, each student should submit a report for assessment by a panel of examiners.