Ministry of Higher Education

University of Technology

Chemical Eng.Dep.

M.Sc. Programe in Chemical Engineering

Outline of Syllabuses Allocation of Subjects and Weekly Load

2007/2008

Preface

Postgraduate studies in the Department of Chemical Engineering were established in 1979 starting with a Masters of Science degree in industrial unit operations. The duration of the course was one year after which the student is granted a Higher Diploma Certificate which qualifies him for a second year during which the student is asked to prepare a dissertation in the field of industrial unit operations after which the student is granted an M.Sc. degree.

The Doctor of Philosophy Degree in Chemical Engineering was established in 1987 which consists of a one year course after which the student has to sit a comprehensive examination and then prepare a thesis after a two year research project in any of the fine specializations of Chemical Engineering.

For the sake of catching up with the scientific, development in the modern science frontiers, a Master of Science Course was established in 1987 in the field of Engineering Materials followed by Master of Science in Petroleum Refinery and Petrochemicals, and Master of Science in Corrosion Engineering both in 1988. The last two courses have been stopped for technical reasons and the first was re-established in 2004.

In 1998, an M.Sc. degree in Biochemical Engineering was established. In 2001 a higher diploma degree in oil and Gas Refining Engineering was established followed by a higher diploma degree in Industrial Pollution Engineering.

The duration of both higher diploma degrees was one year consisted of a course plus a research in the field concerned. These two courses are both halted for technical academic reasons.

In the academic year 2004-2005, the post- graduate studies were concentrated only on a M.Sc. degree in industrial unit operations and the M.Sc. course in Petroleum Refining and Petrochemical Industries was re-opened due to its importance in modern industries. In addition to the Ph.D. the number of post- graduate students graduated from the department is 256 Ph.D., M.Sc. and Higher Diploma Students till 2004.

The aims of the above degrees are to provide the graduates with advanced knowledge in the fundamental topics in Chemical Engineering and to prepare specialized personnel for scientific research and academic fields. Postgraduate studies involved a scientific collaboration strategy reflected by the joint supervision with pioneers in the field of Chemical Engineering from other universities and from industry to interchange knowledge and experience between university and industry.

Prof. Mumtaz A. Zablouk

Head of Chemical Engineering Department

M.Sc. Program in Chemical Engineering / Unit Operations

First Time

Subject	Hours / week	Units
Fluid Flow	3	3
Mass Transfer	3	3
Process Control	2	2
Thermodynamics	2	2
Option (1)	2	2
English Language (I)	1	1
Total	13	13

Second Time

Subject	Hours / week	Units
Heat Transfer	2	2
Numerical Analysis	2	2
Reactor Design	3	3
Mathematical Modeling	2	2
Option (2)	2	2
English Language (II)	1	1
Computer Application	2	---
Total	14	12

Total Theoretical Units	**25**
Dissertation Units	**12**
Grand Total /Units	**37**

Optional Subjects

1-Separation Process
2-Environmental Engineering
3-Catalysts Engineering
4- Polymer Technology
5-Corrosion Engineering

M.Sc Program in Chemical Engineering / Petroleum Refining and Petrochemical Industries

First Time		
Subject	**Hours / week**	**Units**
Fluid Flow	3	3
Heterogeneous Reactors	3	3
Numerical Analysis	2	2
Petroleum Refining Engineering	3	3
Option (1)	2	2
English Language (I)	1	1
Total	14	14

Second Time		
Subject	**Hours / week**	**Units**
Heat Transfer	3	3
Thermodynamics	2	2
Gas Technology	2	2
Petrochemical Complexes	2	2
Option (2)	2	2
English Language (II)	1	1
Computer Applications	2	---
Total	13	12

Total Theoretical Units	**26**
Dissertation Units	**12**
Grand Total /Units	**38**

Optional Subjects
1- Mass Transfer in Petroleum Engineering.
2- Pollutions from oil Industry.
3- Corrosion Engineering in Oil Equipment.
4- Mathematical Modeling.
5- Control of Processes.

DESCRIPTION AND BREAKDOWN OF SUBJECTS
M.Sc. COURSE UNIT- OPERATION

1- Fluid Flow

Momentum equation for Newtonian fluid and boundary layer theory, Turbulent flow and design of looping pipes for multiphase flow, Friction losses in pipes and column, Fittings.

2- Mass Transfer

Diffusion and mass transfer, Equation of change in multi-component systems, Boundary layer theory, Heat transfer and concentration distribution in turbulent flow, Mass transfer theory and Mass transfer equations in solid materials with chemical reaction.

3- Process Control

Analysis and design of feedback control system, Analysis and design of advanced control systems, Design of control system for multi control of complete variable Process plant, Process control using digital computers.

4- Heat Transfer

Hydrodynamic and thermal boundary layer, Heat transfer in laminar tube flow, Unsteady state, Heat velocity and temperature profile in turbulent flow, Air cooler design.

5- Reactor Design

Design of isothermal reactor, Multi reactions, Catalytic reaction and distribution of residence time for chemical reaction, Catalyst for non idea reaction.

M.Sc. PETROLEUM REFINING & PETROCHEMICAL INDUSTRIES

1- Fluid Flow

Momentum equation for Newtonian and Non-Newtonian fluids, Compressible fluid flow and hydrodynamic boundary layer, Laminar and turbulent flow in tubes, Two-phase pipeline design, Optimum diameter and velocity, Looping, Drag reduction.

2- Petroleum Refinery Engineering

Physical properties and evaluation of oil, Fractionation and stripping, Distillation column design, Desulphurization, Catalytic and thermal processes: Reforming and isomerization, Cracking, and hydro-cracking, Rebuilding of hydrocarbons, Lube oil processing, Heavy cuts evaluation.

3- Heat Transfer

Hydrodynamic and thermal boundary layers, Analysis of heat transfer in laminar tube flow, Heat transfer to non-Newtonian fluids, unsteady state heat transfer, Design equations for predicting heat transfer rates, Design of tubular furnaces, Air cooler design, Heat exchangers networks, cooling towers

4- Heterogeneous Reactors

Heat transfer and hydrodynamics of heterogeneous reactors, Mass transfer rates, modeling of heterogeneous reactors, Design and applications of heterogeneous reactors.

5- Gas Technology

Physical properties of natural gases, De-gassing, Water- hydrocarbon system behavior, Absorption, Dehydration and Sweetening, Adsorption processes, Mass transfer operations applied to separation of gaseous mixture, Liquefaction processes, storage equipment, Safety devices.

6- Petrochemical Complexes

Structure and schemes of petrochemical industries. Main petrochemical equipment: steam crackers, quench towers, scrubbers. Olefin and aromatic plants, Hydrogen plants, Synthesis gas, Unit processes for intermediates. Polymerization and Polycondensation. Trends in petrochemical industries.

COMMON SUBJECTS

1-Thermodynamics

Measurement and prediction of Thermodynamic properties, Determination and computation of P. V. T.: functions from equation of state, Corresponding states, Redlich, CSP and other correlations. Vapour-liquid equilibrium processes: Equilibrium stage processes, Flash calculation expressions, K- values and graphical correlations, Convergence pressure, K- charts. Compression and expansion processes with applications.

2- Numerical Analysis

Algebraic and differential equations, Curve fitting, Interpolating polynomials, Statistical analysis, Computer applications.

3- Control of Petroleum Processes

Control theory with applications to design of loops of feedback, feed forward, Adaptive and computer control cascade and ratio control, Multivariable problem and introduction to control of hydrocarbon plant, Optimum control.

4- Corrosion Engineering in Oil Equipment

Metal Corrosion mechanism, Study of behavior of methods of application for oil equipment like distillation towers, coolers, furnaces and storage tanks.

5- Mathematical Modeling

Introduction, Mass transfer model in different columns, Model for mass transfer drops, Simultaneous heat and mass transfer model Mathematical model for mass transfer with chemical reaction.

6- English Language

English Language (I)

1- Passage of general scientific interest
2- Grammar points
   a- Simple present
   b- Present continuous
   c- Present perfect
3- How to make Questions
4- Passive voice (1)

English Language (II)

1- Passages of general scientific interest
4- Grammar points
   a- Passive voice (2)
   b- If clear
   c- Joining sentences

OPTIONS SUBJECTS: UNIT OPERATION OR PETROLUM REFINING OF PETROCHEMICAL

1- Separation Processes

Design methods for diff separation methods Energy requirements in separation processes and heat exchanger with application in separation processes. Transfer in Porous media with of without chemical reaction. Adsorption and advanced theory in separation processes of fluid- solid.

2- Environmental Engineering

Air Pollution, design the industrial ventilation, water Pollution and treatment methods. Solid -wastewater desalination by Reverse osmosis and electrodialysis.

3- Catalysts Engineering

Type of catalyst and physical chemical Properties. Kinetics of chemisorption and physical absorption. Catalytic reaction and design reactors. Catalytic formation and measurement methods of quality. Regeneration of catalysts homogeneous catalysts industrial application of catalytic processes.

4- Polymer Technology

Introduction to petrochemical processes, Polymer classification and types, Industrial application of polymers, Chemical reactions in polymer technology, Ethylene plant, LDPE and HDPE.

5- Corrosion Engineering

Metal corrosion, applied method for protection metals from corrosion.

6- Pollution from Petroleum Industries

Introduction, Water pollution in oil industry and methods of treatment, Air pollution in refineries Ventilation equipment, Design in refineries, Oil wastes and methods of treatment, Oil disasters.

7- Mass Transfer in Petroleum Engineering

Introduction to mass transfer, multi-component systems, Boundary layer theory, Mass transfer theory , Diffusion in solid catalysts with chemical reaction, Heat transfer and concentration distribution in turbulent flow.