Basic Principles of Membrane Technology	M. Mulder

CHENG 516- Polymer Machinery and Product Manufacturing	
Syllabus	
Injection moulding, terminology, process description, moulding cycle, classification of moulds, gates, elements of plasticating process, classification of screw, classification of machine hydraulics, trouble shooting of injection moulding, reaction injection moulding, Extrusion, principle, types of extruders, single screw and twin-screw extruders, die design, dies for tubular film, extrusion profiles, lamination, extrusion of elastomers, elastic properties of polymer melt, die swell, Blow moulding, basis, process variables, injection & stretch blow moulding, extrusion blow moulding, process controls for blow moulding machine, trouble shooting in blow moulding, Thermoforming, thermoforming machinery, heating of sheet, heating cycle, stretching, shrinkage, trimming operations, Rotational moulding, types of machines, calendering, types of calenders and strainer, embosser, crowning, types of powder coating, finishing and machining of plastics, joining, welding and assembling of plastics	
References	
Injection mould design: a design manual for the thermoplastics industry	Pye, R. G. W
Extruder principles and operation	Stevens, M. J., & Covas,

CHENG 514- ADVANCED NUMERICAL ANALYSIS	
Syllabus	
This course on Numerical Analysis has been designed with the following learning objectives in mind 1- Clearly bring out role of approximation theory in the process of developing a numerical recipe for 2- solving an engineering problem 3- Introduce geometric ideas associated with the development of numerical schemes It is shown that majority of problems can be converted to computable forms (discretized) using three fundamental ideas in the approximation theory, namely Taylor series expansion, polynomial interpolation and least square approximation. In addition, the student is expected to clearly understand role of the following four fundamental tools 1- Linear Algebraic Equation 2- Nonlinear Algebraic Equations 3- Ordinary Differential Equations- Initial Value Problem 4- Optimization	
References	
Linear Algebra and Its Applications	Gilbert Strang
Theory and Applications of NumericalAnalysis	Philips, G. M.

CHENG 515- Membrane Technology	
Syllabus	
This course will provide an insight to the membrane based separations that is an integral part of the down-stream processing of various industries. The course begins with introducing the development of membranes and discussing the basics which is followed by detail discussion on membrane materials and their properties. This course then deals with various methods of membrane preparations and their characterization. How separations (transport mechanism) takes places using membranes has been covered extensively. Further, principles of various membrane processes such as reverse osmosis, microfiltration, ultrafiltration, dialysis, liquid membrane, pervaporation, etc. has been covered along with their applications in different industries. The course will enable students to develop necessary skills to design appropriate membrane based separation technique as per the need.	
References	
Membrane Technology and Applications	R.W. Baker

CHENG 512- NATURAL GAS PROCESSING	
Syllabus	
This unit is a comprehensive overview of the processing of natural gas from its extraction to the production of its major products: liquefied natural gas (LNG), liquefied petroleum gas (LPG), sales gas and a feedstock for the petrochemical industry. Students begin by learning about wellhead conditions, gas separation, transport and flow assurance, hydrates and their control, dehydration and the removal of contaminants, including CO2, H2S and Hg. LNG production covers precooling, cold section distillation, liquefaction, storage, transport and regasification. Emphasis is given to LNG refrigeration: basic thermodynamics, practical configurations and their optimisation. LPG production includes product specifications, C3 and C4 separation, condensate treatment and storage. Optimised configurations for sales gas production and gas distribution are covered. In addition, students learn about safety, risk management, material selection, control and economics related to natural gas processing.	
References	
Natural Gas	James Speight
Advanced Natural Gas Engineering	Xiuli Wang and Michael Economides

CHENG 513- ADVANCES IN POLYMER PROCESSING	
Syllabus	
This course is an advanced course in polymer technology, where the focus is rather on the properties and behavior of the polymeric material from a more industrial point of view than on the fundamental chemistry and physics of polymers. The course covers areas such as processing and processing methods of polymers, mechanical properties, differences between polymers and other material as well as differences within the vast group of polymeric materials. Besides the more commonly used plastics, the course also deals with fibers, nanocomposites, polymer semiconductors as well as biopolymers and biodegradable polymers. The course also discusses the recycling of plastics and gives an overview of a new generation of polymers originating from renewable resources, thereby giving a better understanding of how plastic materials can be used in a sustainable society.	
References	
Polymer Extrusion	Chris Rauwenda
Modeling Of Polymer Processing	Isayav

CHENG 510- CORROSION MANAGEMENT AND CONTROL	
Syllabus	
Introduction - Definitions of Corrosion - Overall classification of types of corrosion-Basi electrochemistry – Galvanic and electrolytic cells – Potential measurements - EMF and Galvanic series – Galvani corrosion and bimetallic contacts – Eh – pH diagrams – Electrode – solution interface Electrode kinetics an polarization phenomena – Hydrogen induced cracking; Some case studies; Methods of prevention and testing; Erosion, fretting and Wear, Environmental factors and corrosion: Corrosion in water and Aaqueous solutions; Corrosion in sulphur bearing solutions; Microbiologically induced corrosion; Corrosion in soil; Corrosion of concrete; Corrosion in acidic and alkaline process streams. Atmospheric and elevated temperature corrosion: Atmospheric corrosion and its prevention; Oxidation at elevated temperatures; Alloying; Oxidising environments, Prevention and control of corrosion: Cathodic protection; Coatings and inhibitors; Material selection and design.	
References	
Principles and Prevention of Corrosion	Denny A Jones
, Corrosion Engineering	M. G. Fontana

CHENG 511- ENVIRONMENTAL ENGINEERING	
Syllabus	
Fundamental Concepts and Definitions. PVT relationships. First law of Thermodynamics. Application of law to different processes in closed systems. Second Law of Thermodynamics. Physical meaning of entropy. T-S diagrams. Relations among thermodynamic properties. Thermodynamic functions in terms of measurable properties. Construction of thermodynamic charts. Third Law of Thermodynamics. Thermodynamics of flow processes. Application of first law to flow processes. Power and Refrigeration Cycles. Single Component Systems. Multicomponent Systems. Phase Equilibria. Thermodynamics of Electrolytes. Statistical Thermodynamics.	
References	
Concept of Ecology Prentice-Hall of India, N. Delhi	Kormondy
Environmental Science Environmental Pollution	J. Turk & A. Turk

Pretreatment technologies for membrane seawater desalination	

CHENG 508- PROCESS OPTIMIZATION	
Syllabus	
The objective of this course is to introduce optimization techniques to engineering students, with an emphasis on problems arising in Chemical Engineering applications. The course includes both linear and nonlinear programming problems. The first portion of the course introduces the basic concepts in optimization and how to obtain a mathematical representation of the optimization problem. The second portion of the course describes different solution techniques that can be used to actually solve such problems. Finally, a set of software tools for solution of optimization problems are also discussed. Upon successful completion of this course, the student will be able to understand the basic theoretical principle in optimization, formulate the optimization problem, and choose appropriate method/solver for solution of the optimization problem	
References	
Optimisation of Chemical Processes	Edgar, T.F., Himmelblau, D.M
Engineering Optimisation	Reklaitis, G.V., Ravindran, A., Ragsdell, K.M

CHENG 509- ADVANCES IN PETROLEUM REFINERY ENGINEERING	
Syllabus	
Fundamental Concepts and Definitions. PVT relationships. First law of Thermodynamics. Application of law to different processes in closed systems. Second Law of Thermodynamics. Physical meaning of entropy. T-S diagrams. Relations among thermodynamic properties. Thermodynamic functions in terms of measurable properties. Construction of thermodynamic charts. Third Law of Thermodynamics. Thermodynamics of flow processes. Application of first law to flow processes. Power and Refrigeration Cycles. Single Component Systems. Multicomponent Systems. Phase Equilibria. Thermodynamics of Electrolytes. Statistical Thermodynamics.	
References	
Petroleum Engineering: Drilling and Well Completion	Carl Gatlin
Drilling Engineering	Azar and G. Robello Samue

11. Understand Process Safety Management (PSM).	
References	
Chemical Process Safety: Fundamentals with Applications	Daniel A. Crowl and Joseph F. Louvar
Safety and Accident Prevention in Chemical Operation	H.H. Fawcett & W. S .Wood,

CHENG 506- PROCESS AND ENERGY INTEGRATION	
Syllabus	
Introduction to process integration, role of thermodynamics in process design, targeting of energy, area, number of units, and cost, super targeting, concept of pinch technology and its application. Heat exchanger networks analysis, Maximum Energy Recovery (MER) networks for multiple utilities and multiple pinches, design of heat exchanger network. Heat integrated distillation columns, evaporators, dryers, and reactors. Waste and waste water minimisation, flue gas emission targeting, heat and power integration. Case studies.	
References	
Heat Exchanger Network Synthesis	Shenoy U.V
Chemical Process Design	Smith R

CHENG 507- WATER DESALINATION	
Syllabus	
The course provides theoretical and practical aspects of seawater/brackish water desalination technologies. The main topics include basic concepts of water chemistry; detailed evaluation and technology description of thermal-based (MSF, MED, VC) and membrane-based (RO, NF, ED/EDR) desalination processes; conventional and innovative intake and pretreatment systems (including MF, UF); process design and system performance; fouling, scaling (including bio-fouling) and cleaning; product water quality and post-treatment. Other related topics such as innovative desalination technologies (Forward Osmosis (FO), Membrane Distillation (MD), Adsorption Desalination (AD)); energy consumption; environmental impact; economics; hybrid systems; desalination using renewable energy; trends of desalination market; full scale plants and case studies, will also be covered in this course depending on time availability.	
References	
Guidebook to Membrane Desalination Technology	

CHENG 504- ADVANCED CHEMICAL REACTION ENGINEERING	
Syllabus	
The objective of this course is to impart and to continue the rigorous study of reaction engineering. In this course, particular emphasis will be given to chemical kinetics and transport phenomena, review of elements of reaction kinetics, rate processes in heterogeneous reacting systems, design of fluid-fluid and fluid-solid reactors, scale-up and stability of chemical reactors and residence time analysis of heterogeneous chemical reactors. The objective of this course is to help the student master several advanced ideas in chemical reaction engineering, notably: • Complex chemical reaction mechanisms and kinetics. • Transport effects in multiphase reactive systems. • Advanced reactor design and stability, including consideration of the energy balance. • Computational tools for reaction engineering	
References	
Elements of Chemical Reaction Engineering,	H.S.A. FOGLER
Chemical Reaction Engineering	John Wiley & Sons Inc

CHENG 505- ADVANCED PROCESS SAFETY ENGINEERING
Syllabus
Course Objectives Upon completion of this course, a student should be able to: 1. Work safely in a laboratory setting. 2. Be familiar with personal protection equipment and the reasons for use. 3. Be familiar with proper methods for disposing of chemical waste. 4. Be familiar with known hazards such as dust and vapor explosions. 5. Understand the fire triangle and the methods used to avoid explosions. 6. Be aware of methods used for incident investigation. 7. Be aware of the factors that can lead to an accident. 8. Be aware of societal issues concerning technology and the impact of the practice of chemical engineering on the surrounding and larger community. 9. Be aware of ethical issues and principles in chemical engineering practice. 10. Understand risk assessment.

CHENG 502- MATHEMATICAL METHODS FOR CHEMICAL ENGINEERS	
Syllabus	
The course will cover three main parts: a) matrix and vector analysis, b) ordinary differential equations and c) partial differential equations. Matrix theory will focus on the solution of equations, linear algebra and linear operators. Vector analysis will focus on basic operations and differential field operations, including the transformations to curvilinear coordinates and integral theorems. For ordinary differential equations, both analytical and numerical methods for solutions will be presented, including qualitative analysis and generalized series solutions. For partial differential equations, different solution methods will be discussed, including numerical methods such as finite elements and finite difference methods, analytical methods such as separation of variables method, integral transform methods and similarity methods. Visualization and analysis of the solutions will be emphasized through computer Projects.	
References	
Mathematical Methods in Chemical Engineering	V.G. Jenson and G. V. Jeffreys
Advanced Engineering Mathematics	P. O'Neil 2003

CHENG 503- ADVANCED SEPARATION PROCESSES	
Syllabus	
Complex distillation processes such as azeotropic and extractive distillation, membrane separations processes and adsorption, ion exchange and chromatographic separations. Types and choice of membranes, Plate and frame, tubular, spiral wound and hollow fiber membrane reactors and their relative merits, Commercial, pilot plant and laboratory membranes permeates involving dialysis, reverse osmosis, Nanofiltration, ultrafiltration, Microfiltration and Donnan dialysis, Economics of membrane operations, Ceramic membranes.	
References	
Membrane Science and Technology	Osadar, Varid Nakagawa
Separation Process Technology	Ronald W.Roussel

CHENG 501- ADVANCED PROCESS THERMODYNAMICS	
Syllabus	
Fundamental Concepts and Definitions. PVT relationships. First law of Thermodynamics. Application of law to different processes in closed systems. Second Law of Thermodynamics. Physical meaning of entropy. T-S diagrams. Relations among thermodynamic properties. Thermodynamic functions in terms of measurable properties. Construction of thermodynamic charts. Third Law of Thermodynamics. Thermodynamics of flow processes. Application of first law to flow processes. Power and Refrigeration Cycles. Single Component Systems. Multicomponent Systems. Phase Equilibria. Thermodynamics of Electrolytes. Statistical Thermodynamics.	
References	
Introduction to Engineering Thermodynamics	J. M. Smith and Van Ness.
Introduction to Chemical Engineering Thermodynamics	Rao Y.V.C.
Chemical Engineering Thermodynamics	B. F. Dodge
Chemical Engg. Thermodynamics.	Rao Y.V.C.

CHENG 500- TRANSPORT PHENOMENA	
Syllabus	
Transport Phenomena is the subject which deals with the movement of different physical quantities such as momentum, energy and mass in any chemical or mechanical process and combines the basic principles (conservation laws) and laws of various types of transport. Transport Phenomena can be classified into three types: Momentum transport deals with the transport of momentum in fluids and is also known as fluid dynamics. Solution of equation of motion provides information about the velocity distribution in the system. Energy transport deals with the transport of different forms of energy in a system and is also commonly known as heat transfer. Solution of basic equation of thermal energy provides the information= about the temperature distribution in the system. Mass transport deals with the transport of various chemical species in a system. The solution of convective diffusion equation provides the information about the concentration distribution in the system.	
References	
Transport Phenomena	R. Byron Bird
Transport Phenomena for chemical rector design	Laurence A. Belfiore

المقررات الاختيارية 9 - (ساعات معتمدة)

NO	اسم المادة	Course Title	رمز المقرر	عدد الوحدات	الساعات الاسبوعية Weekly Hours	
					نظري	المجموع
				Cred.	Lect.	Total
1	هندسة سلامة العمليات المتقدمة	ADVANCED PROCESS SAFETY ENGINEERING	CHENG 505	3	3	3
2	تكامل العمليات والطاقة	PROCESS AND ENERGY INTEGRATION	CHENG 506	3	3	3
3	تحلية المياه	WATER DESALINATION	CHENG 507	3	3	3
4	عمليات التحسين	PROCESS OPTIMIZATION	CHENG 508	3	3	3
5	هندسة تكرير البترول المتقدمة	ADVANCES IN PETROLEUM REFINERY ENGINEERING	CHENG 509	3	3	3
6	إدارة ومراقبة التآكل	CORROSION MANAGEMENT AND CONTROL	CHENG 510	3	3	3
7	هندسة بيئية	ENVIRONMENTAL ENGINEERING	CHENG 511	3	3	3
8	معالجة الغاز الطبيعي	NATURAL GAS PROCESSING	CHENG 512	3	3	3
9	معالجة البوليمر المتقدمة	ADVANCES IN POLYMER PROCESSING	CHENG 513	3	3	3
10	التحليل العددي المتقدم	ADVANCED NUMERICAL ANALYSIS	CHENG 514	3	3	3
11	تكنولوجيا الأغشية	Membrane Technology	CHENG 515	3	3	3
12	آلات البوليمر والمنتجات	Polymer Machinery and Product Manufacturing	CHENG 516	3	3	3
13	مواضيع خاصة في الهندسة الكيميائية	SPECIAL TOPICS	CHENG 517	3	3	3
	المجموع	Total		39	39	39

وفيما يلي تفصيل المقرارات الاجبارية:

Weekly Hours الساعات الاسبوعية			عدد الوحدات	رمز المقرر	Course Title	اسم المادة	NO
المجموع	عملي	نظري					
Total	Lab.	Lect.	Cred.				
3	-	3	3	CHENG 500	ADVANCED TRANSPORT PHENOMENA	ظواهر انتقال متقدمة	1
3	-	3	3	CHENG 501	ADVANCED PROCESS THERMODYNAMICS	ديناميك حرارية متقدمة	2
3	-	3	3	CHENG 502	MATHEMATICAL METHODS FOR CHEMICAL ENGINEERS	الطرق الرياضية في الهندسة الكيميائية	3
3	-	3	3	CHENG 503	ADVANCED SEPARATION PROCESSES	عمليات الفصل المتقدمة	4
3	-	3	3	CHENG 504	ADVANCED CHEMICAL REACTION ENGINEERING	هندسة تفاعلات كيميائية متقدم	5
9			9		THESIS	رسالة الماجستير	
24	-	**24**	**24**		**Total**	المجموع	

شروط قبول برنامج ماجستير الهندسة الكيميائية

ماجستير الهندسة الكيميائية	
الكلية التابع لها البرنامج	**كلية الهندسة التقنية**
نوع و مواعيد الدراسة	**انتظام**
نوع البرنامج	**عام**
بالاضافة الي شروط القبول العامة يشترط التالي	
التقدير المطلوب	جيد مرتفع
التخصص المطلوب	الهندسة الكيميائية - الهندسة الميكانيكية-الهندسة النووية-الهندسة الحرارية ملاحظة :لا يتم قبول خريجي الكليات التقنية
اختبار المفاضلة	لا يوجد
اختبار القدرات العامة للجامعيين	مطلوب درجة 65 كحد أدنى
اختبار اللغة الانجليزية	
آلية المفاضلة	تتم المفاضلة وفق الآتي : المعدل التراكمي 50 %. اختبار القدرات للجامعيين 40 %. مدى قرب تخصص المتقدم من تخصص البرنامج 10%.
موافقة جهة العمل	مطلوبة

جامعة النجم الساطع / البريقة

كلـية الهندسـة التقنـية

((ماجستير هندسة كيميائية))

المتطلبات الدراسية للدرجة العلمية

الحصول على درجة الماجستير في الهندسة الكيميائية(بالمقررات الدراسية و الرساله)

يتطلب إكمال دراسة (33) ساعة معتمدة موزعة على النحو التالي:

أ-	المقررات الاجبارية	15ساعة معتمدة
ب-	المقررات الاختيارية	9 ساعة معتمد
ج-	رسالة الماجستير	9 ساعة معتمدة