



Bachelor of Science in Chemical Engineering Program Specialist Course Syllabi

Course Code	CHE 111			
Course Title	Physical Chemistry			
Hours	Credit	Lec.	Lab.	Tut.
	2	2	--	1
Prerequisite	CHEM 106 -4			
Course Description	This course includes the following: States of matter: Gas laws, Ideal and real gases. Thermodynamics: The First, second and third law, Heat Capacity, Enthalpy, Gibbs Free Energy and entropy as well as equilibrium constant and Thermochemistry. Galvanic cell, Chemical Kinetics, solutions.			
Textbook	Mortimer R.G. , "Physical Chemistry", Elsevier ,3rd Ed. (2008).			

Course Code	CHE 112			
Course Title	Organic Chemistry			
Hours	Credit	Lec.	Lab.	Tut.
	3	2	3	--
Prerequisite	CHEM 101			
Course Description	This course presents the principles of organic chemistry, basic organic reactions related to studied families (aliphatic and aromatic), synthesis, and characteristic reactions for some organic based oxygen compound (alcohols, carbonyl groups, carboxylic acids, etc).			
Textbook	Wade , Jr. L. G, "Organic Chemistry". 6 th edn. Prentice Hall, 2006.			

Course Code	CHE 213			
Course Title	Introduction to Chemical Engineering			
Hours	Credit	Lec.	Lab.	Tut.
	3	3	--	--
Prerequisite	CHE 111			
Course Description	Definitions of chemical engineering. Introduction to chemical engineering calculations. Definition of chemical engineer and its fields. System of Unit and dimensions. Conversion between units. Material balances in chemical processes and combustion, Ideal gas, Applications of Dalton 's law of partial pressure and Amagat laws and general gas law			
Textbook	David M. Himmelblau James B. Riggs Basic Principles and Calculations in Chemical Engineering, Prentice Hall, 7 th ed, ISBN-10: 0131406345, 2003.			



Course Code	CHE 214			
Course Title	Chemical Industries			
Hours	Credit	Lec.	Lab.	Tut.
	4	3	2	1
Prerequisite	CHE 112			
Course Description	This course covers a broad range of technology in chemical industries that exist or important to the KINGDOM ARABIA SAUDI. The course considers the processing of raw materials into useful products such as: Water treatment - Manufacture of soda ash - Manufacture of Caustic Soda - Manufacture of Sulfuric Acid - Cement Technology - Manufacture of Vegetable Oil and Soap. The course activities include trips to some factories.			
Textbook	Shreev, R.N. & Brink, J.A.: Chemical Process Industries, 5 th Edition, McGraw Hill, 1987.			

Course Code	CHE 215			
Course Title	Material Science			
Hours	Credit	Lec.	Lab.	Tut.
	3	2	2	--
Prerequisite	ME 251			
Course Description	In this course the main subject of study will be Classification of engineering materials, atomic and molecular bonding. Properties and microstructure. Order in solids, phases and solid- solutions, crystal geometry. Disorder in solids, phase diagrams, solid-state transformations. Applications of metals, ceramics, polymers and composites. Mechanical, electrical, chemical, thermal and optical properties. Involves laboratory experiments related to the microstructure and properties.			
Textbook	Callister † Jr. W.D, "Materials Science & Engineering", 7th ed., John Wiley & Sons, 2007.			



Course Code	CHE 216			
Course Title	Chemical Engineering Thermodynamics (1)			
Hours	Credit	Lec.	Lab.	Tut.
	3	2	2	--
Prerequisite	CHE 213			
Course Description	Thermodynamics is the science of energy and entropy and can be understanding by emphasizing the physics and physical arguments. This course cover the basic principles of thermodynamics and provides a thorough exposition of the principles of thermodynamics and details their application to chemical processes.			
Textbook	J.M. Smith, Hendrick Van Ness, Michael Abbott, Introduction to Chemical Engineering Thermodynamics, Mcgraw-Hill Chemical Engineering Series, 7 th Edition, 2010.			

Course Code	CHE 231			
Course Title	Momentum Transfer			
Hours	Credit	Lec.	Lab.	Tut.
	3	2	2	1
Prerequisite	MATH 228			
Course Description	Principles of momentum transfer and overall balance : Introduction- fluid statics- general molecular transport equation – viscosity of fluid- types of flow and Reynolds number, over all mass balance and continuity equation- over all momentum balance –shell momentum balance and velocity profile in laminar flow-design equation for laminar and turbulent flow in pipes - compressible flow of gases. Applications: Flow past immersed objects and packed and fluidized beds- measurement of flow of fluids- pumps and gas moving equipment- agitation and mixing of fluid and power requirements- non-Newtonian fluids – differential equations of continuity- boundary layer flow and turbulence - dimensional analysis in momentum transfer.			
Textbook	Christil J Geankolpis, Transport processes and Unit Operations, second edition Printice hall international, inc., ISBN 0-13-045253-X, 1993.			

Course Code	CHE 232
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Course Title	Heat Transfer			
Hours	Credit	Lec.	Lab.	Tut.
	3	2	2	--
Prerequisite	CHE 231			
Course Description	This course will give students a sufficient background on the concepts of heat transfer Heat Transfer by Conduction, Convection and Radiation. Steady State and Transient State, Convective Heat Transfer Processes, Analysis of Convection Heat Transfer, Methods to evaluate convection heat transfer, Internal flow convection heat transfer , Heat transfer in laminar tube flow, Flow across cylinders and sphere, Heat exchangers and design oriented problems, Criteria for the selection of heat exchanger			
Textbook	Coulson and Richardson's "Chemical Engineering Volume 1, Chapter 9, 7th edition, 2017			

Course Code	CHE 317			
Course Title	Safety in Chemical Processes Industries			
Hours	Credit	Lec.	Lab.	Tut.
	3	2	2	-
Prerequisite	CHE 215			
Course Description	This course deals with the fundamentals of safety in operation plants. It teaches the appropriate safety equipment, health program, and minimum safety requirements in working areas. The course will give an Introduction to safety in chemical, mechanical, industrial and electrical plants, the risk of chemical process affecting people and the environment. It discusses general safety procedures in plants, fire protection, and personal risks during operation of chemical plants. It discusses Personal protection equipment and application of hazard evaluation techniques and hazard management.			
Textbook	-Crowl. D.A, Louvar. J.F, "Chemical Processes Safety: Fundamentals with applications", Prentice Hall, 2012 - Health and Safety Executive , "Designing and operating safe chemical reaction processes", © Crown copyright 2000			



Course Code	CHE 318			
Course Title	Chemical Engineering Thermodynamics (2)			
Hours	Credit	Lec.	Lab.	Tut.
	3	2	2	1
Prerequisite	CHE 216			
Course Description	The course is an extension of CHE 216 and introduce an review of the first law of thermodynamics. The course concern on the second and third laws of thermodynamics and its application related to chemical engineering processes and Demonstrate experiments to obtain familiarity with the properties of steam.			
Textbook	J.M. Smith, Hendrick Van Ness, Michael Abbott, Introduction to Chemical Engineering Thermodynamics, Mcgraw-Hill Chemical Engineering Series, 7 th Edition, 2010.			

Course Code	CHE 333			
Course Title	Mass Transfer			
Hours	Credit	Lec.	Lab.	Tut.
	4	3	2	1
Prerequisite	CHE 232			
Course Description	This course introduces mass transfer in chemical engineering The course covers introduction to mass transfer operations such as: Absorption, stripping, extraction, leaching evaporation and drying and distillation etc. also involves diffusion process in details diffusion in fluids and solid diffusion ; the mass transfer coefficients for laminar and turbulent diffusion. Many applications of mass transfer processes are considered in the course.; Analogies between mass, momentum and heat transfer covered in the course.			
Textbook	Christil J Geankolpis Transport Processes and Unit Operations, 2 nd ed. Printice hall international, inc., ISBN 0-13-045253-X, 1996.			

Course	CHE 334
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Code				
Course Title	Chemical Engineering Laboratory			
Hours	Credit	Lec.	Lab.	Tut.
	3	1	4	--
Prerequisite	CHE 232			
Course Description	This course emphasizes concepts presented previously in the transport phenomena, chemical reactions engineering and separation processes that are not covered in the student curriculum. Safe practices are strictly discussed. Students carry out selected experiments in momentum transfer, heat transfer, mass transfer, separation processes and chemical reactions. Data from experimental observations are collected, analyzed and compared to applicable theories to evaluate performance and efficiency of operations			
Textbook	Robert, H Perry & Don W Green. "Chemical Engineers' 8 th Edition, McGraw-Hill Book Company, NYcopyright Inc. ISBN 9780071422949, 2008.			

Course Code	CHE 335			
Course Title	Separation Processes			
Hours	Credit	Lec.	Lab.	Tut.
	3	2	2	--
Prerequisite	CHE 333			
Course Description	In this course the main subject of study will be the basic principles of mass transfer, thermodynamics, heat transfer mass transfer, thermodynamics, heat transfer and apply these principles to the different separation processes. Application of chemical engineering principles in separation processes including: distillation, gas absorption, liquid- liquid extraction, drying, evaporation, crystallization, chromatographic and centrifugation process, factors affecting on this process, different equipment of various types and their components, design of these separation processes under consideration of their economical and environment impact.			
Textbook	Robert, H Perry & Don W Green. "Chemical Engineers' 8 th Edition, McGraw-Hill Book Company, NYcopyright Inc. ISBN 9780071422949, 2008.			

Course Code	CHE 341
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Course Title	Computer Applications			
Hours	Credit	Lec.	Lab.	Tut.
	3	1	4	--
Prerequisite	CSC 222 & CHE 213			
Course Description	The course introduce: appropriate computer applications and information technology as applied to chemical engineering. Design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health, safety, manufacturability, and sustainability. Mathematical and computer techniques to solve numerical problems in chemical engineering and Analyze and interpret experiments conducted in chemical engineering.			
Textbook	Cutlip, M. Shacham, M., Problem Solving in Chemical and Biochemical Engineering with POLYMATH, Excel, and MATLAB, 2nd Edition, 2007, Prentice Hall.			

Code Course	CHE 342			
Course Title	Modeling and Simulation			
Hours	Credit	Lec.	Lab.	Tut.
	3	2	2	--
Prerequisite	CHE 341			
Course Description	The course covers the basic concepts of chemical process modeling and simulation and the corresponding methodologies. Differentiate between chemical process systems in terms of their behavior (steady-state and dynamic). Develop mathematical models for chemical processes based on basic knowledge on conservation laws, heat, mass and momentum transfer operations, and chemical reaction rate and kinetics. Formulate strategies for solving chemical process mathematical models. Predict the impact of chemical process modeling and simulation on the society, environment, and global economy.			
Textbook	Luyben W.L, "Process Modeling Simulation & Control". 3 ^{ed} Ed. McGraw-Hill, 1996.			



Course Code	CHE 351			
Course Title	Kinetics and Reactor Design			
Hours	Credit	Lec.	Lab.	Tut.
	3	2	--	1
Prerequisite	MATH 336			
Course Description	This course aims to establish fundamental knowledge for the students in chemical engineering through: interpret and analyze chemical reaction kinetics data; apply reaction kinetics principles in chemical reaction engineering; mole balances, rate laws and stoichiometry for single and multiple reactions and its applications to steady-state, the isothermal reactor design, catalysis and catalytic reactor, specify and size the most common industrial chemical reactors to achieve production goals for processes involving homogeneous or heterogenous reaction systems.			
Textbook	Fogler, H.S., "Elements of Chemical Reaction Engineering", 4th Ed., Prentice Hall, Englewood Cliffs, New Jersey, 2006.			

Course Code	CHE 437			
Course Title	Advanced Separation Processes			
Hours	Credit	Lec.	Lab.	Tut.
	3	3	--	1
Prerequisite	CHE 335			
Course Description	This course is a completion of CHE335 and outline an advanced conventional processes in separation techniques. Estimate the fundamental of separation methods and technologies, in advanced techniques for equilibrium-based fluid separation: Reverse Osmosis, Ultra filtration, Micro filtration, Pressure swing Adsorption, Electrostatic Precipitator, Supported Liquid Membrane and ,Supercritical Fluid Extraction.			
Textbook	Perry, R. H. and Green, D. W. "Chemical Engineers' Handbook", 7th Edition, McGraw-Hill Book Company, NY, (1997).			



Course Code	CHE 443			
Course Title	Processes Control			
Hours	Credit	Lec.	Lab.	Tut.
	3	2	2	--
Prerequisite	CHE 342 & CHE 333			
Course Description	This course introduces process control in chemical engineering . The course covers basic concepts such as elements of control loop, classification of process control strategies, theoretical model of chemical process, dynamic behavior of process, dynamic behavior of the first order and second order process, feedback and feed forward control, also involves laplace transforms and block diagram techniques. Furthermore controller types ,P,PI ,PID controllers , dynamic behavior and stability included . The course involves various applications of control schemes for physical and block diagram and system stability.			
Textbook	.E. Seborg, T.F. Edgar, D.A. Mellichamp, Process Dynamics and Control. John Wiley, second edition, 2003.			

Course Code	CHE 444			
Course Title	Mathematical Methods in Chemical Engineering			
Hours	Credit	Lec.	Lab.	Tut.
	3	3	--	1
Prerequisite	CHE 342			
Course Description	The course describes the difference between numerical methods and pure mathematical methods for solving chemical engineering mathematical models and formulates mathematical models applicable to the study of chemical engineering and estimate the errors resulting from the use of numerical methods.			
Textbook	R.L. Burden, J.D. Faires, "Numerical Analysis", Brookes/ Pub. 7th Ed. , 2000.			



Course Code	CHE 452			
Course Title	Plant Design and Economics			
Hours	Credit	Lec.	Lab.	Tut.
	3	2	--	1
Prerequisite	CHE 335-3			
Course Description	This course focuses on engineering and economic aspects involved in the development or modification of process plants. It involves the application of principles learned in other chemical engineering courses like mass and heat transfer, Kinetics and Reactor Design and momentum transfer to design of equipment, systems and plants based on discussion of factors important in chemical plant design..			
Textbook	Coulson & Richardson's, Chemical Engineering, volume 6, Butterworth-Heinemann, Elsevier, 2015.			

Course Code	CHE 453			
Course Title	Heat Exchanger Design			
Hours	Credit	Lec.	Lab.	Tut.
	2	2	--	1
Prerequisite	CHE 444			
Course Description	This course cover an description and applications of different heat exchangers in process industries. Design of double pipe heat exchanger (including extended surfaces). Detailed design procedures for shell and tube heat exchanger for single phase flow. Detailed design procedures for air coolers. Selection criteria for heat exchangers. Descriptive discussion of condensers, evaporators and reboilers, novel heat exchangers and other types of heat exchangers.			
Textbook	Coulson and Richardson's "Chemical Engineering Volume 1 and volume 6			



Course Code	CHE 454			
Course Title	Catalysis & Catalytic Processes			
Hours	Credit	Lec.	Lab.	Tut.
	2	2	--	1
Prerequisite	CHE 444			
Course Description	This undergraduate course in chemical engineering provides a comprehensive introduction to catalysis. Students will explore the fundamental concepts of catalysts, the classification of catalysts, and the mechanisms behind catalytic reactions. They will learn how to derive catalytic reaction laws and apply them to reactor design. The course covers both isothermal and non-isothermal catalytic reactions, as well as catalytic mass transfer and deactivation. By the end of the course, students will have a solid understanding of catalysis and its applications in industrial processes.			
Textbook	Fogler, H. S. (2020). Elements of chemical reaction engineering (6th ed.). Prentice Hall.			

Course Code	CHE 455			
Course Title	Biochemical Engineering			
Hours	Credit	Lec.	Lab.	Tut.
	2	2	--	1
Prerequisite	CHE 444			
Course Description	This course provides basic knowledge in the field of biochemical engineering, particularly in the fields of cell biology, biotechnology, and bioprocess engineering. This course focuses on the interaction of chemical engineering, biochemistry, and microbiology. Some of the topics the course may cover are as follows: concept of biochemical/bioprocess engineering, introduction to bioreactor, bioreactor design to convert animal waste into the gas of methane (CH ₄), basic biology overview, how cells work, major metabolic pathways (metabolism), proteins, enzymes, carbohydrates, fats, genetic engineering, artificial and natural methods for alternating DNA of organism, mathematical representations of microbial systems, kinetics of growth and death, continuous fermentation, agitation, mass transfer, and scale-up in fermentation systems, enzyme technology, and technology of extracellular vesicles (EVs).			
Textbook	Michael L. Shuler and Fikret Kargi Bioprocess Engineering Basic Concepts 2 ^{ed} Ed. Prentice Hall PTR. ISBN 0-13-081908-5, 2002.			



Course Code	CHE 456			
Course Title	Polymers Technology			
Hours	Credit	Lec.	Lab.	Tut.
	2	2	--	1
Prerequisite	CHE 444			
Course Description	This course introduces a review on polymer science, polymer synthesis and growth mechanisms, polymer degradation and the environment. Additives, blends and composites. Polymer processing and rheology. polymers for advanced technologies Structure and physical properties of polymers. Homogeneous and heterogeneous polymerization processes. The chemical, mechanical, and engineering properties of polymers as well as polymer processing and rheology are emphasized in this course.			
Textbook	Joel R. Fried, Polymer Science and Technology, 2nd edition, 2003			

Course Code	CHE 461			
Course Title	Environmental Engineering			
Hours	Credit	Lec.	Lab.	Tut.
	2	2	--	--
Prerequisite	CHEM 206			
Course Description	This course gives principles to protect and utilize natural resources, and improve environmental quality to be healthy through an introduction to major areas of interest in environmental protection namely, soil, air and water pollution			
Textbook	Wastewater Engineering: Treatment, Disposal and Reuse, Metcalf & Eddy, 3rd Edition, 1991 Paul L. Bishop, "Pollution prevention: Fundamentals and Practice" Waveland Pr Inc., 2004,			

Course Code	CHE 462			
Course Title	Corrosion Engineering			
Hours	Credit	Lec.	Lab.	Tut.
	3	2	2	--
Prerequisite	EE 111			
Course Description	the course cover Electrochemical mechanisms, corrosion kinetics, polarization and corrosion rates, passivity. Methods testing used in corrosion for iron and steel and the effects of various parameters. Pourbaix diagrams. Effect of stresses on corrosion. Corrosion control technologies.			
Textbook	Pierre R. Roberge "Handbook of Corrosion Engineering" McGraw-Hill Companies, Inc. 2000			

Course Code	CHE 463			
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Course Title	Water pollution control and treatment			
Hours	Credit	Lec.	Lab.	Tut.
	3	3	--	1
Prerequisite	CHE 335			
Course Description	This course will highlight the following: ethics in water treatment, water treatment units. Classification of treatment systems, quality of water: surface and ground water sources, water quality standards for various uses. Raw water quality impacts on treatment. Sedimentation: types of settling, design criteria for sedimentation tank, tube and plate settlers. Coagulation and flocculation: stability and destabilization of colloids, coagulation theory, types of flocculators and their design aspects. Filtration, hardness removal: types, ions causing hardness, lime soda treatment, problems associated with hardness. Disinfection process: mode of disinfection, rate of disinfection, factors affecting processes, chemical and non-chemical methods of disinfection.			
Textbook	Metcalf&Eddy Wastewater Engineering: Treatment, Disposal and Reuse, 4 th Ed, 2010.			

Course Code	CHE 464			
Course Title	Water Desalination			
Hours	Credit	Lec.	Lab.	Tut.
	2	2	--	1
Prerequisite	CHE 463			
Course Description	A course will cover the concept of desalination methods as well as membrane based desalination technologies, and Comparison between different desalination methods: distillation/condensation techniques, membrane techniques and ion exchange techniques. Develop process concepts, evaluate their utility, and move forward into preliminary design for projects and sites where water desalination is an operational requirement			
Textbook	Cipollina A., Micale G., Rizzuti L.: "Seawater Desalination: Conventional and Renewable Energy Processes", Springer , 2009.			

Course Code	CHE 465			
Course Title	Solid and hazardous waste management			
Hours	Credit	Lec.	Lab.	Tut.
	2	2	--	1
Prerequisite	CHE 463			
Course Description	This course cover the Integrated solid and hazardous waste management. Waste sources, characteristics, generation, collection, transfer and transport. Waste recycling, reuse, recovery, treatment and disposal. Industrial waste management issues and productivity. Hazardous treatment and disposal.			
Textbook	LaGrega, Michael D., Phillip.L. Buckingham, and J.C. Evans. Environmental Recourse Management. Hazardous Waste Management. 2 nd Edition.,Wave Land Press, Inc. 2010.			



Course Code	CHE 466			
Course Title	Risk Analysis and Management for Chemical Engineers			
Hours	Credit	Lec.	Lab.	Tut.
	2	2	--	1
Prerequisite	CHE 463			
Course Description	This course introduces the notion of risk in logistics management and strategic decision making. It is designed to develop an understanding of the fundamentals of risk management and to introduce classical as well as state-of-the-art risk analysis techniques. Central concepts in risk analysis will be discussed. Methods for calculation and evaluation of risk will be discussed with reference to real cases. The potential of system thinking as a risk management tool will be emphasized.			
Textbook	Vlasta Molak Fundamentals of Risk Analysis and Risk Management, CRC Press; 1 st edition, 1996			

Course Code	CHE 467			
Course Title	Air Pollution Control			
Hours	Credit	Lec.	Lab.	Tut.
	2	2	--	1
Prerequisite	CHE 463			
Course Description	This course introduces rules and regulations, Meteorology and air pollution, sources and effects of air pollution; air quality, atmospheric reactions and scavenging processes. Meteorological setting for dispersion of air pollutants. Theory of atmospheric dispersion modeling. Air pollution control concepts, selection, evaluation and application of control devices for emission and control from chemical and petrochemical industries.			
Textbook	Vallero, Daniel A, "Fundamentals Of Air Pollution" 5 th edition. Amsterdam ; Boston : Elsevier, ISBN: 9780124046023, 2014.			



Course Code	CHE 471			
Course Title	Petrochemical Engineering			
Hours	Credit	Lec.	Lab.	Tut.
	4	3	2	1
Prerequisite	CHE 335			
Course Description	The course cover the uses petroleum and its derivatives as raw materials to produce chemicals (e.g. ethylene, propylene, benzene, toluene), solvents, adhesives, detergents, plastics, polymers and fibers, lubricants, fertilizers, agrochemicals and evaluate the economical and marketing aspects of the petrochemical industry			
Textbook	Uttam Ray Chaudhuri," Fundamentals of Petroleum and Petrochemical, Engineering", CRC Press, 2011			
Course Code	CHE 472			
Course Title	Energy Technology			
Hours	Credit	Lec.	Lab.	Tut.
	2	2	--	1
Prerequisite	CHE 437			
Course Description	The course cover the efficiencies of both new and established energy generation and conversion methods; electricity generation by fossil fuels, nuclear, solar, wind and hydropower; and alternative energy technologies. The environmental consequences of energy choices on local, national and global scales, including toxic emissions, greenhouse gases and resource depletion are also discussed and integrated throughout the course.			
Textbook	Schaeffer, John. Real Goods Solar Living Sourcebook: The Complete Guide to Renewable Energy Technologies and Sustainable Living, 30 th ed., Gaiam, 2007			

Course Code	CHE 473			
Course Title	Petroleum Refining			
Hours	Credit	Lec.	Lab.	Tut.
	2	2	--	1
Prerequisite	CHE 437			
Course Description	This course presents a comprehensive introduction to petroleum refining technology and economics. The focus is on transportation fuels refineries, an overview of crude oil supply and petroleum product demand, a description of refinery process technology such as crude oil distillation, heavy oil conversion options, hydrotreating, and catalytic reforming.			
Textbook	James H. Gary, Glenn E. Handwerk, Mark J. Kaiser, Petroleum Refining: Technology and Economics, Fifth Edition 5 th Edition, CRC press, 2007.			



Course Code	CHE 474			
Course Title	Cryogenic Technology			
Hours	Credit	Lec.	Lab.	Tut.
	2	2	--	1
Prerequisite	CHE 437			
Course Description	The course deals with basic understandings on theories and practices of cryogenic engineering through production, maintenance and applications of low temperature, typically below -150°C . with the advancement of technology and growth of human knowledge. Very low temperature processes: air liquefaction, cryogenic engines (for rocket propulsion), cryogenic surgery. Application of cryogenics in medical, biological and food preservation processes.			
Textbook	Randall F. Barron Cryogenic Systems (Monographs on Cryogenics) 2 nd Edition Oxford University Press; ISBN-13: 978-0195035674, 1985.			

Course Code	CHE 475			
Course Title	Natural gas Engineering			
Hours	Credit	Lec.	Lab.	Tut.
	2	2	--	1
Prerequisite	CHE 437			
Course Description	This course aims to study the industrial processes that take place on natural gas from its exit from the ground until it reaches the consumer. It includes all pollutant separation processes: separation of liquid and solid materials, gas sweating, separation of water vapors, mercury separation, nitrogen separation, condensate separation, and by the end of this course The student will be able to calculate the properties of natural gas, design separation systems, and calculate the transporting properties of natural gas.			
Textbook	Xiuli Wang and XGAS Crowl. "Advanced Natural Gas Engineering", Gulf Publishing Company, Houston, Texas (2009)			

Course Code	CHE 496			
Course Title	Summer training			
Hours	Credit	Lec.	Lab.	Tut.
	2	2	--	--
Prerequisites	ENG 357 and Department approval			
Course Description	8 weeks of training in the industry under the supervision of a faculty member. Each student presents a report on work carried out by during the training period, in addition to any other requirements assigned to him by the administration.			
Textbook	-----			



Course Code	CHE 498			
Course Title	Senior Design Project (1)			
Hours	Credit	Lec.	Lab.	Tut.
	1	--	2	1
Prerequisites	(complete 118 hour)			
Course Description	Scheduled sheds light on the study of how to set up a program for the graduation project in the field of chemical engineering through the design depends on application of fundamental theories to practical chemical engineering operations studied in previous years and what the student gained from the training field factories.			
Textbook	To be determined by the supervisor according to the project topics			

Course Code	CHE 499			
Course Title	Senior Design Project (2)			
Hours	Credit	Lec.	Lab.	Tut.
	3	--	6	1
Prerequisites	CHE 498			
Course Description	The student graduation project implementation which have been set up in his thirteen level (to fulfill the requirements of the project specifications point of academic accreditation)			
Textbook	To be determined by the supervisor according to the project topics			