Kingdom of Saudi Arabia
Ministry Of Higher Education
Najran University
College of engineering

المملكة العربية السعودية
وزارة التعـــليم العـــالي
جامـــعـــة نجــــران
كـــليــة الهنـــدسة

Chemical engineering department

College (College of Engineering) Department (Chemical Engineering)–Specialty (Chemical Engineering)-Bachelor

3rd Semester			
Code No.	Title	CR	Pre-requisite
PHYS 104-4	Principles of General Physics	4	-
CHEM 101-4	General Chemistry I	4	-
MATH 106-3	Integral Calculus	3	-
ENGL 107	Technical Writing for Engineers	3	-
IC 111-2	Introduction to Islamic Culture	2	-
Total		16	

4th Semester			
Code No.	Title	CR	Pre-requisite
PHYS105-4	Advanced Physics	4	PHYS104
CHEM 103-4	General Chemistry II	4	CHEM 101
MATH 107-3	Algebra & Analytical Geometry	3	-
MATH 203-3	Advanced Calculus	3	MATH 106
ENGL 108-2	Communication Skills for Engineers	2	ENGL107
IC 112-2	Islamic Culture 2	2	-
Total		18	

5th Semester			
Code No.	Title	CR	Pre-requisite
CHEM245-4	Organic Chemistry I	4	CHEM 103
MATH204-3	Differential Equations	3	MATH 106 and 203
GE 203-3	Engineering Drawing	3	-
CHE 211-3	Principles of Chemical Engineering I	3	CHEM103 PHYS105
EE 211-3	Fundamental of Electric Circuits	3	MATH 106 PHYS 105
Arab 201-2	Language Skills	2	-
Total		18	

6th Semester			
Code No.	Title	CR	Pre-requisite
CHEM 230 - 3	Physical Chemistry	3	CHEM 103
GE 101-3	Engineering Mechanics	3	MATH 107
CHE 221-3	Chemical Eng Thermodynamics	3	MATH 203 CHE 211
CHE 222-3	Fluid mechanics	3	MATH 204
CHE 223-3	Principles of Chemical Engineering II	3	CHE 211
GE 204 -3	Computer Programming for Engineers	3	MATH106
Total		18	

7th Semester			
Code No.	Title	CR	Pre-requisite
CHEM 311 - 3	Analytical Chemistry	3	CHEM 103 CHEM 245
CHE 314 - 3	Mass Transfer	3	MATH 204, CHE 221, CHE 223
CHE 311-2	Industrial Safety	2	CHE 223
CHE 312-3	Heat Transfer	3	CHE 222
CHE 313-3	Phase and Chemical Equilibria	3	CHE 221
GE 306 -2	Engineering Economy	2	-
CHE 315 - 2	Chemical Eng Lab 1	2	ENGL107 CHE222-223
Total		18	

8th Semester			
Code No.	Title	CR	Pre-requisite
CHE 321-3	Separation processes	3	CHE312-313-314
CHE 322-3	Kinetics and Reactor Design	3	CHEM 230 CHE 221
CHE 323-2	Chem Eng Lab 2	2	ENGL107 CHE312 – 313-314
GE 311-3	Numerical Methods	3	MATH 204
GE 312-3	Statistics for Engineers	3	-
IC 113-2	Islamic Culture 3	2	-
Total		16	

9th Semester			
Code No.	Title	CR	Pre-requisite
CHE 411-3	Chemical process dynamics and control	3	CHE 321-322
CHE 412-3	Chemical Engineering Design	3	CHE321
CHE 413-3	Materials of Chemical Engineering	3	CHEM245
Arab 202-2	Arabic Writing	2	-
CHE 491	Graduation Project 1	2	LEVEL 8
GE 407-2	Management of Engineering Projects	2	GE 306
Total		15	

10th Semester			
Code No.	Title	CR	Pre-requisite
CHE 421-3	Nanotechnology	3	CHE 413
CHE 422-3	Advanced materials and energy	3	CHE 321
CHE 423-3	Biology for Engineers	3	
CHE 492	Graduation Project 2	3	LEVEL 9
IC 114-2	Islamic Culture 4	2	
CHE 493-3	Industrial Training	0	90 credit hours
Total		14	

Total credits required in degree program: 133

Introduction

Chemical engineering department at Najran University is founded in 1434/1435 H. chemical engineers have a key role in the field of technology. In addition to that, their contribution to community has gain more attention recently. The main task of chemical engineers is to design, apply, and control industrial processes in a rapidly changing situation. Chemical engineering department at Najran University offers the bachelor degree in chemical engineering and the objectives of the program is to provide the next generations of chemical engineers with a high quality education including the fundamentals of chemical engineering and engineering science along side the awareness of local industrial needs as well as education and communication skills.

Vision

Our goal is to achieve excellence in engineering education and scientific research through chemical engineering program that is suitable for the needs of local market and designed according to international standards.

Mission

The role of chemical engineering department at Najran university is to provide a modern program that is set according to the latest educational systems to prepare engineers to perform their tasks in their career life including self-education, planning, innovation, engineering problems solving, leadership, effective communication as well as performing scientific research through projects and community services programs.

Program objectives

Upon completion of this program, graduates will be able to:
1. Perform design, analysis and problem solving in chemical engineering.
2. Apply the academic knowledge in chemical engineering practice.
3. Use effective communication skills.
4. Get involved in life-long learning for career development and planning, including post-graduate studies and scientific research.
5. Identify and respond to ethical issues.

Program outcomes

The outcomes of chemical engineering program are:
(a) an ability to apply knowledge of mathematics, science, and engineering
(b) an ability to design and conduct experiments, as well as to analyze and interpret data
(c) an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
(d) an ability to function on multidisciplinary teams
(e) an ability to identify, formulate, and solve engineering problems
(f) an understanding of professional and ethical responsibility
(g) an ability to communicate effectively
(h) the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
(i) a recognition of the need for, and an ability to engage in life-long learning
(j) a knowledge of contemporary issues

Kingdom of Saudi Arabia
Ministry Of Higher Education
Najran University
College of engineering

Chemical engineering department

المملكة العربية السعودية
وزارة التعــــليم العــــالي
جامـــعـــة نجـــران
كــليــة الهنــــدسة

Table 1: Coding and numbering

0	First year: Levels 1 and 2 (Preparatory year)
1	Second year of Engineering: Levels 3 and 4
2	Third year of Engineering: Levels 5 and 6
3	Fourth year of Engineering: Levels 7 and 8
4	Fifth year of Engineering: Levels 9 and 10

Codes

Each course will have a code consists of two parts. The first part contains letters to represent the department as the following:

Departments codes:

"GE-General Engineering"

"CHE-Chemical Engineering"

"EE-Electrical Engineering"

The second part of the code contains numbers to represent the academic year, semester and serial number as the following:

Course numbering:

First digit: 1 to 5 – Academic year

Second digit: 1 or 2 - Semester

Third digit: 1 to 9 - Serial

Exception:

- Courses from outside the college – their contents have not been changed- will keep their current coding.

- Graduation project will take the numbers 491-492.

Kingdom of Saudi Arabia
Ministry Of Higher Education
Najran University
College of engineering

المملكة العربية السعودية
وزارة التعـــليم العـــالي
جامــــعـــة نجـــران
كــــليـــة الهنــــدسة

جامعة نجران
NAJRAN UNIVERSITY

Chemical engineering department

Course distribution for chemical engineering plan

The following table represents the distribution of all courses between the university requirements, college requirements, other departments and chemical engineering courses.

No	Group name		Course code	Course name	Credit hours	level
1	**University Requirements**	**Islamic culture and Arabic language**	**IC 111**	Introduction to Islamic culture	2	3
			IC 112	Islamic culture(2)	2	4
			IC 113	Islamic culture(3)	2	8
			IC 114	Islamic culture(4)	2	10
			ARAB201	Language skills	2	5
			ARAB202	Arabic writing	2	9
		English Language	**ENGL 107**	Technical writing for engineers	3	3
			ENGL 108	Communication skills for engineers	2	4
2	**Basic science (College Requirements)**	**Mathematics**	**MATH 106**	Integral Calculus	3	3
			MATH 107	Algebra & Analytical Geometry	3	3
			MATH 203	Advanced Calculus	3	4
			MATH 204	Differential Equations	3	5
		Physics	**PHY 104**	Principles of General Physics	4	3
			PHY 105	Advanced Physics	4	4
		Chemistry	**CHEM 101**	General Chemistry 1	4	3
	Basic science (Additional Requirements)	**Chemistry**	**CHEM 103**	General Chemistry 2	4	4
			CHEM 245	Organic Chemistry 1	4	5
			CHEM 230	Physical Chemistry	3	6
			CHEM 311	Analytical Chemistry	3	7
3	**Supportive Engineering Courses**	**General engineering**	**GE 203**	Engineering Drawing	3	5
			GE 101	Engineering mechanics	3	6
			GE 204	Computer programming for Engineers	3	6
			GE 306	Engineering economy	2	7
			GE 311	Numerical Methods	3	8
			GE 312	Statistics for engineers	3	8
			GE 407	Management of Engineering Projects	2	9

Kingdom of Saudi Arabia
Ministry Of Higher Education
Najran University
College of engineering

جامعة نجران
NAJRAN UNIVERSITY

المملكة العربية السعودية
وزارة التعـــليم العـــالي
جامـــعـــة نجـــران
كـــليـــة الهنـــدسة

Chemical engineering department

4		**Electrical engineering**	**EE 211**	Fundamental of Electric Circuits	3	5
		Chemical Engineering Courses	**CHE211**	Principles of chemical engineering 1	3	5
			CHE223	Principles of chemical engineering 2	3	6
			CHE221	Chemical engineering thermodynamics	3	6
			CHE222	Fluid mechanics	3	6
			CHE223	Mass transfer	3	7
			CHE311	Industrial safety	2	7
			CHE312	Heat transfer	3	7
			CHE313	Phase and chemical equilibria	3	7
			CHE323	Chemical engineering lab1	2	7
			CHE321	Separation processes	3	8
			CHE322	Kinetics and reactors design	3	8
			CHE411	Chemical process dynamics and control	3	9
			CHE412	Chemical engineering design	3	9
			CHE413	Materials of chemical engineering	3	9
			CHE414	Chemical engineering lab 2	2	8
			CHE421	Nanotechnology	3	10
			CHE422	Advanced material and energy	3	10
			CHE423	Biology for engineers	3	10
			CHE491	Graduation project 1	3	9
			CHE492	Graduation project 2	3	10
			CHE493	Industrial Training	0	10

Kingdom of Saudi Arabia
Ministry Of Higher Education
Najran University
College of engineering

المملكة العربية السعودية
وزارة التعـــــليم العـــالي
جامـــعـــــة نجـــــران
كـــليــــة الهنــــــــدسة

Chemical engineering department

Distribution of units for university, college, other departments and chemical engineering.

	University requirements (IC-ARAB-ENGL)	College requirements (MATH-PHY-CHEM)	Supportive requirements (CHEM)	Additional engineering courses (GE-EE)	Chemical engineering courses (CHE)	Total Units
Total units	17	24	14	22	56	133
Percentage	12.8	18.1	10.5	16.5	42.1	100

Kingdom of Saudi Arabia
Ministry Of Higher Education
Najran University
College of engineering

جامعة نجران
NAJRAN UNIVERSITY

Chemical engineering department

المملكة العربية السعودية
وزارة التعــــليم العـــالي
جامــــعـــة نجـــــران
كـــليــة الهنـــــدسة

Course Description

Principles of General Physics	مبادىء الفيزياء العامة

Program/Department	Chemical Engineering Program	Code	PHYS

1. General Information	
Course Code	**PHYS 104 – 4**
Course Title	**Principles of General Physics**
Credit Hours	**4 (3,1)**
Pre -requisites	**None**
Co-requisites	**-**
Level	**3rd**
Language	

2. Course Description
Vectors, Newton's Laws of Motion, Work and Energy, Properties of Matter, and their Flow, Principles of Heat, Static and Dynamic Electricity, Sound and Optics.

3. Course Outcomes	
CO1	Study of vectors
CO2	Study of Newton's Laws of Motion
CO3	Properties of materials and liquids
CO4	Principles of heat, Static and Dynamic electricity

3. Teaching Methods and Strategies			
☐	Lectures.	☐	practical projects.
☐	Exercises,	☐	Positive participation/interaction by students.
☐	Discussion Circles.	☐	Different/Interactive illustration Shows
☐	Group work/projects.	☐	Experiments: Laboratory / Field.
☐	Presentations by students.	☐	Field Visits
☐	Reports: Simple / Comprehensive.		
☐	Computer software/application		

4. Learning Resources	
Text Book	"Physics for Scientist and Engineers", by Serway, Raymond, Saunders. College Publishing, Last Edition.
References	

Course Description

General Chemistry	**الكيمياء العامة**

Program/Department	**Chemical Engineering Program**	**Code**	**CHEM**

1. General Information

Course Code	**CHEM 101 - 4**
Course Title	**General Chemistry 1**
Credit Hours	**4 (3,1)**
Pre -requisites	**None**
Co-requisites	
Level	**3rd**
Language	

2. Course Description

Stoichiometry and Chemical Arithmetic. Gaseous state - The liquid state – Solutions - Properties of mixtures - Chemical equilibrium - Introduction to organic chemistry: History of organic chemistry, Chemistry of carbons, homologues series, Functional Groups, Hydrocarbons

3. Course Outcomes

CO1	Ability to apply the concepts and the basic principles of chemistry and their important in many different fields.
CO2	Knowledge of the different states of matter and properties of the substance in the gas, liquid and solid state.
CO3	Show knowledge of the use of gas laws to calculate the pressure, volume, density and diffusion speed.
CO4	Knowledge of the types of solutions and methods of expressing concentration, and the law of chemical equilibrium
CO5	Ability to apply the basics of organic chemistry, and recognize their importance.

3. Teaching Methods and Strategies

☐	Lectures.	☐	practical projects.
☐	Exercises,	☐	Positive participation/interaction by students.
☐	Discussion Circles.	☐	Different/Interactive illustration Shows
☐	Group work/projects.	☐	Experiments: Laboratory / Field.
☐	Presentations by students.	☐	Field Visits
☐	Reports: Simple / Comprehensive.		
☐	Computer software/application		

4. Learning Resources

Text Book	"General Chemistry, Principles and structures" by j . Bardy
References	"General Chemistry, Principle and Modern Applications" by Ralph H. Petruccii and William S. Harwood, Prentice-Hall, New Gersey, 1997. "Chemistry, The study of Matter and its Changes" by James E. Brady and John R. Holum, Wiley, New York, 1993. "Experiments in general, Organic and Biological chem". by R.I. Ouellette.

Kingdom of Saudi Arabia
Ministry Of Higher Education
Najran University
College of engineering

جامعة نجران
NAJRAN UNIVERSITY

Chemical engineering department

المملكة العربية السعودية
وزارة التعــــليم العــالي
جامـــعـــــة نجــــران
كـــليــــة الهنـــــدسة

Course Description

Integral Calculus	حساب التكامل

Program/Department	**Chemical Engineering Program**	**Code**	**MATH**

1. General Information	
Course Code	**MATH 106 – 3**
Course Title	**Integral Calculus**
Credit Hours	**3 (3,0,0)**
Pre -requisites	**None**
Co-requisites	
Level	**3th**
Language	

2. Course Description
Integration: indefinite integral (definition, geometric meaning, basic properties). Techniques of integration by parts, trigonometric substitutions, partial fractions, quadratic expressions,…etc . Integration of certain classes of trigonometric functions. Definite integral: Riemann integral - Upper and lower sums, geometric meaning of definite integral, properties of definite integral. Intermediate value theorem for integrals. Fundamental theorem of Calculus. Applications of the definite integral: area, volume, work, arc length. Approximations by the Trapezoidal and Simpson rules.

3. Course Outcomes	
CO1	To Know the concepts of indefinite and definite integrals.
CO2	Be able to use the techniques of integration.
CO3	Apply the techniques of integration for solving problems from mathematics and other fields.
CO4	To use computer for solving numerical integration problems.

3. Teaching Methods and Strategies			
☐	Lectures.	☐	practical projects.
☐	Exercises,	☐	Positive participation/interaction by students.
☐	Discussion Circles.	☐	Different/Interactive illustration Shows
☐	Group work/projects.	☐	Experiments: Laboratory / Field.
☐	Presentations by students.	☐	Field Visits
☐	Reports: Simple / Comprehensive.		
☐	Computer software/application		

4. Learning Resources	
Text Book	"Calculus with analytical geometry", by Howard Anton, John Wiley and Sons.
References	"Calculus and Analytic Geometry" by George B. Thomas, Ross L. Finney, Addison-Wesley

Kingdom of Saudi Arabia
Ministry Of Higher Education
Najran University
College of engineering

Chemical engineering department

المملكة العربية السعودية
وزارة التعــــليم العـــالي
جامـــعـــة نجـــران
كــليــة الهنــدسة

Course Description

Technical Writing for Engineers	الكتابة الفنية للمهندسين

Program/Department	Chemical Engineering Program	Code	ENGL

1. General Information

Course Code	**ENGL 107-3**
Course Title	**Technical Writing for Engineers**
Credit Hours	**3(3, 0,0)**
Pre -requisites	**None**
Co-requisites	
Level	**3rd**
Language	

2. Course Description

Introduction to technical writing; define your role as a technical writer; choosing a topic, determining the purpose for writing, analyzing an audience, evaluating common ground; types of technical correspondence (memo, letters, abstracts, communication of dilemma, emails; principles of good writing; writing CVs, writing as a process; preparation (as a way to generate ideas); research (the access to support); writing topic sentences and formulating supporting details; writing an introduction paragraph, writing body paragraphs, writing a conclusion paragraph; revising and editing.

3. Course Outcomes

CO1	Know the principles of technical writing.
CO2	Know how to write scientific reports.
CO3	Know the concepts of delivering technical massages.

3. Teaching Methods and Strategies

☐	Lectures.	☐	practical projects.
☐	Exercises,	☐	Positive participation/interaction by students.
☐	Discussion Circles.	☐	Different/Interactive illustration Shows
☐	Group work/projects.	☐	Experiments: Laboratory / Field.
☐	Presentations by students.	☐	Field Visits
☐	Reports: Simple / Comprehensive.		
☐	Computer software/application		

4. Learning Resources

Text Book	"The Mayfield Handbook of Technical and Scientific writing". By Perelman, Leslie C., James Paradis, and Edward Barrett. New York, NY: McGraw-Hill.
References	"Developing Composition Skills". By Rutten, Mary K., "Writing Skills, an English Workbook", by Gordan, Ann, American University of Beirut, Last Edition.

Course Description

Advanced Physics	الفيزياء المتقدمه

Program/Department	**Chemical Engineering Program**	**Code**	**PHYS**

1. General Information			
Course Code	**PHYS 105 – 4**		
Course Title	**Advanced Physics**		
Credit Hours	**4 (3, 1)**		
Pre -requisites	**PHYS 104**		
Co-requisites			
Level	**4th**		
Language			

2. Course Description
Atomic structure: electronic configuration, classification of elements, energy levels. Crystal structure: lattice, symmetry, space group, examples for simple structure. Electrical properties of materials and electricity: classification of materials. Magnetic properties of materials and magnetism. Thermal properties of materials: thermal energy, thermoelectric power (Seebeck Effect). Mechanical properties of matter (Young's modulus, tensile stress).

3. Course Outcomes	
CO1	Knowledge of basic principles of electricity, magnetism and mechanical properties of materials.
CO2	The correlation between the atomic structure or crystal structure and the properties of the materials.
CO3	learning how to use these information for designing circuits, or for calculating load on building

3. Teaching Methods and Strategies			
☐	Lectures.	☐	practical projects.
☐	Exercises,	☐	Positive participation/interaction by students.
☐	Discussion Circles.	☐	Different/Interactive illustration Shows
☐	Group work/projects.	☐	Experiments: Laboratory / Field.
☐	Presentations by students.	☐	Field Visits
☐	Reports: Simple / Comprehensive.		
☐	Computer software/application		

4. Learning Resources	
Text Book	"Physics for scientist and Engineers", by Serway, Raymond, Saunders. College Publishing, Last Edition.
References	

Course Description

General Chemistry II	الكيمياء العامة 2

Program/Department	Chemical Engineering Program	Code	CHEM

1. General Information

Course Code	**CHEM 103-4**
Course Title	**General Chemistry II**
Credit Hours	**4 (3,1)**
Pre -requisites	**CHEM 101-4**
Co-requisites	
Level	**4th**
Language	

2. Course Description

Atomic structure and the periodic table and chemical bonds. Students carry out selected experiments of testing-related properties of the solid, liquid and fluid and electrolytes.

3. Course Outcomes

CO1	Know the electronic structure to the periodic table and chemical bonds.
CO2	Demonstrate the skills to do the chemical experiments related to the properties of solid and liquid states and the solutions

3. Teaching Methods and Strategies

☐	Lectures.	☐	practical projects.
☐	Exercises,	☐	Positive participation/interaction by students.
☐	Discussion Circles.	☐	Different/Interactive illustration Shows
☐	Group work/projects.	☐	Experiments: Laboratory / Field.
☐	Presentations by students.	☐	Field Visits
☐	Reports: Simple / Comprehensive.		
☐	Computer software/application		

4. Learning Resources

Text Book	الكيمياء العامة – المبادئ والبنية – الجزء الأول – الطبعة الخامسة – تأليف جيمس برادي وجيرارد هيومستون. ترجمة: سليمان سعسع ومأمون حلبي – الناشر: مركز الكتب الأردني.
References	"Inorganic Chemistry", by J. Huheey "Chemistry of Elements", by Greenwood "Advanced Inorganic Chemistry', Cotton & Wilkinson

Kingdom of Saudi Arabia
Ministry Of Higher Education
Najran University
College of engineering

المملكة العربية السعودية
وزارة التعـــــليم العـــالي
جامـــعـــــة نجـــــران
كــــليــــة الهنــــــدسة

Chemical engineering department

Course Description

Algebra and Analytical Geometry	الجبر و الهندسة التحليلية

Program/Department	Chemical Engineering Program	Code	MATH

1. General Information	
Course Code	**MATH 107 – 3**
Course Title	**Algebra and Analytical Geometry**
Credit Hours	**3 (3,0,0)**
Pre -requisites	**None**
Co-requisites	
Level	**4rd**
Language	

2. Course Description

Systems of linear equations, matrices, types of matrices, algebra of matrices, inverse of matrices, determinants, Cramer's rule. Vectors in two and three dimensions and properties of vectors, scalar (dot) and cross products. Distance formula, gradient (or slope), positive and negative slopes, Inclination, parallel and perpendicular lines, straight-line formula, perpendicular distance from a point to a line, the general formula of circle. Conic sections: the parabola, the ellipse, and hyperbola. Rectangular, polar and spherical coordinates; curves in polar coordinates. Equations of lines and planes in space, surfaces.

3. Course Outcomes

CO1	To know the types of matrices and basic concepts of matrices and operations on them.
CO2	Select and apply the concepts of vectors (in the plane and space) in different situations such as geometric drawing.
CO3	Know the general formulas for the equations of a line, circle and the perpendicular-distance function from a point to a line.
CO4	Recognize formulas of conic sections and know rectangular, polar coordinates and curves in polar coordinates.
CO5	Know the equations of line and plane in space.

3. Teaching Methods and Strategies

☐	Lectures.	☐	practical projects.
☐	Exercises,	☐	Positive participation/interaction by students.
☐	Discussion Circles.	☐	Different/Interactive illustration Shows
☐	Group work/projects.	☐	Experiments: Laboratory / Field.
☐	Presentations by students.	☐	Field Visits
☐	Reports: Simple / Comprehensive.		
☐	Computer software/application		

4. Learning Resources

Text Book	"Elementary Linear Algebra", by Bernard Kolman, Macmilan Publshing Inc. "Calculus with analytical geometry", by Howard Anton, John Wiley and Sons.
References	"Elementary Linear algebra" By, Howard Anton John Wiley & sons (1994)

Kingdom of Saudi Arabia
Ministry Of Higher Education
Najran University
College of engineering

جامعة نجران
NAJRAN UNIVERSITY

المملكة العربية السعودية
وزارة التعـــــليم العـــالي
جامـــعــــــة نجــــران
كـــليـــة الهنـــــدسة

Chemical engineering department

Course Description

Advanced Calculus	حساب التفاضل والتكامل المتقدم

Program/Department	Chemical Engineering Program	Code	MATH

1. General Information

Course Code	**MATH 203 – 3**
Course Title	**Advanced Calculus**
Credit Hours	**3 (3,0,0)**
Pre -requisites	**MATH 106**
Co-requisites	
Level	**4th**
Language	

2. Course Description

Infinite sequences, infinite series, convergence and divergence of infinite series, integral test, ratio test, root test and comparison test. Conditional convergence and absolute convergence, alternating series test. Power Series, Taylor and Maclaurin series, Vector valued functions, their limits, continuity, derivatives and integrals. Motion of particle in space, tangential and normal components of acceleration. Function in two or three variables, their limits, continuity, partial derivatives, chain Rule, directional derivatives, tangent planes and normal lines to equations, Extrema of Functions of Several Variables, Lagrange Multipliers, Double integral and its applications to area, volume, moments and center of mass. Double integrals in polar coordinates, triple integral in rectangular, cylindrical and spherical coordinates and applications to volume, the moment and center of mass. Vector fields, line integrals, surface integrals, Green's theorem, and the divergence theorem. Stoke's theorem.

3. Course Outcomes

CO1	Know and apply types of the convergence test for series.
CO2	Interpret graphs of functions of more than one variable.
CO3	Compute differentiation and integration of functions of more than one variable.
CO4	Use double and triple integrals for finding area, volume and center of mass and apply these concepts in different situations.

3. Teaching Methods and Strategies

☐	Lectures.	☐	practical projects.
☐	Exercises,	☐	Positive participation/interaction by students.
☐	Discussion Circles.	☐	Different/Interactive illustration Shows
☐	Group work/projects.	☐	Experiments: Laboratory / Field.
☐	Presentations by students.	☐	Field Visits
☐	Reports: Simple / Comprehensive.		
☐	Computer software/application		

4. Learning Resources

Text Book	"Calculus with analytical geometry", by Earl W. Swokoski, PWS . Kent.
References	"Calculus with analytical geometry", by Howard Anton, John Wiley & Sons.

Kingdom of Saudi Arabia
Ministry Of Higher Education
Najran University
College of engineering

جامعة نجران
NAJRAN UNIVERSITY

Chemical engineering department

المملكة العربية السعودية
وزارة التعـــــليم العـــالي
جامــــعــــة نجـــران
كــــليــــة الهنــــــدسة

Course Description

Communication Skills for Engineers	مهارات الاتصال للمهندسين

Program/Department	Chemical Engineering Program	Code	ENGL

1. General Information

Course Code	**ENGL 108-2**
Course Title	**Communication Skills for Engineers**
Credit Hours	**2 (2,0,0)**
Pre -requisites	**ENGL 107**
Co-requisites	
Level	**4th**
Language	

2. Course Description

Effective use of English language: gather ideas and information, organize ideas relevantly and coherently; engage in debates; participate in group discussions; face interviews; present scientific seminars; make oral presentations; transfer information from non-verbal to verbal texts and vice versa; take part in social and professional communication.

3. Course Outcomes

CO1	Ability to communicate to others.
CO2	Ability to discuss within a group.
CO3	Ability to face interviews.
CO4	Ability to deliver scientific and technical presentations.

3. Teaching Methods and Strategies

☐	Lectures.	☐	practical projects.
☐	Exercises,	☐	Positive participation/interaction by students.
☐	Discussion Circles.	☐	Different/Interactive illustration Shows
☐	Group work/projects.	☐	Experiments: Laboratory / Field.
☐	Presentations by students.	☐	Field Visits
☐	Reports: Simple / Comprehensive.		
☐	Computer software/application		

4. Learning Resources

Text Book	"Technical Communication: Principles and Practices (2008)", by Sangeeta Sharma and Meenakshi Raman, Publisher: Oxford University Press.
References	"Developing Composition Skills", by Rutten, Mary K., , "Writing Skills, an English Workbook", by Gordan, Ann and others ,American University of Beirut, Last Edition

Kingdom of Saudi Arabia
Ministry Of Higher Education
Najran University
College of engineering

Chemical engineering department

المملكة العربية السعودية
وزارة التعــــليم العــالي
جامـــعـــــة نجـــــران
كـــليـــة الهنـــــدسة

Course Description

Organic Chemistry I	الكيمياء العضوية I

Program/Department	Chemical Engineering Program	Code	CHEM

1. General Information

Course Code	**CHEM 245-4**
Course Title	**Organic Chemistry I**
Credit Hours	**4 (3,1)**
Pre -requisites	**CHEM 103**
Co-requisites	
Level	**5th**
Language	

2. Course Description

Introduction to the basics of organic chemistry and its importance in human life. Study of physical and chemical properties and methods of preparation of aliphatic hydrocarbons and aromatic mono- and multi-loop, as well as aliphatic and aromatic halides and chemical reactions of these compounds.

3. Course Outcomes

CO1	Recognition of organic chemistry principles and thier importance.
CO2	Knowledge of aliphatic compounds, properties and preparation.
CO3	Knowledge of aromatic components, its properties and its preparation.
CO4	Skills to prepare the aliphatic and aromatic compounds.

3. Teaching Methods and Strategies

☐	Lectures.	☐	practical projects.
☐	Exercises,	☐	Positive participation/interaction by students.
☐	Discussion Circles.	☐	Different/Interactive illustration Shows
☐	Group work/projects.	☐	Experiments: Laboratory / Field.
☐	Presentations by students.	☐	Field Visits
☐	Reports: Simple / Comprehensive.		
☐	Computer software/application		

4. Learning Resources

Text Book	الكيمياء العضوية د. حسن محمد الحازمي، د. محمد إبراهيم الحسن.
References	"Organic Chemistry Volume I and II". by I.L.Finar. "Elements of Organic Chemistry". by I.Zimmerman "Fundamentals of Organic Chemistry". By George B.Butler. "Introduction to Organic Chemistry". by Andrew Streitwieser,JR.

Course Description

Differential Equations	معادلات تفاضلية

Program/Department	Chemical Engineering Program	Code	MATH

1. General Information

Course Code	**MATH 204 – 3**
Course Title	**Differential Equations**
Credit Hours	**3 (3, 0, 0)**
Pre -requisites	**MATH 106, MATH 203**
Co-requisites	
Level	**5th**
Language	

2. Course Description

Classification and solution of first Order differential equations and their applications, (Growth and decay problems and linear motion problems). Solution of higher Order linear differential equations and their applications (spring problem and projectile problems). The Laplace transforms and its applications to linear systems of differential equations. Series solutions of differential equations. Fourier series

3. Course Outcomes

CO1	Classify a given differential equation into the basic types,
CO2	Solve first Order linear differential equations by various methods,
CO3	Solve second Order linear differential equations (both constant and variable coefficient) by various methods
CO4	Solve systems of first Order linear differential equations using eigensystems,

4. Teaching Methods and Strategies

☐	Lectures.	☐	practical projects.
☐	Exercises,	☐	Positive participation/interaction by students.
☐	Discussion Circles.	☐	Different/Interactive illustration Shows
☐	Group work/projects.	☐	Experiments: Laboratory / Field.
☐	Presentations by students.	☐	Field Visits
☐	Reports: Simple / Comprehensive.		
☐	Computer software/application		

5. Learning Resources

Text Book	"Elementary Differential Equations (8th Edition)", by Earl D. Rainville, Phillip E. Bedient, Richard E. Bedient.
References	"Elementary Differential Equations Boundary Value Problems", 8th Edition, by William E. Boyce, Richard C. DiPrima

Kingdom of Saudi Arabia
Ministry Of Higher Education
Najran University
College of engineering

جامعة نجران
NAJRAN UNIVERSITY

المملكة العربية السعودية
وزارة التعـــــليم العـــالي
جامـــعـــة نجـــران
كـــليـــة الهنـــدسة

Chemical engineering department

Course Description

Engineering Drawing	الرسم الهندسي

Program/Department	Chemical Engineering Program	Code	GE

1. General Information

Course Code	**GE 203 -3**
Course Title	**Engineering Drawing**
Credit Hours	**3 (3,0,1)**
Pre -requisites	**None**
Co-requisites	
Level	**5th**
Language	

2. Course Description

Introduction to drawing, Drawing equipment and use, Skills of Freehand Sketching, Methods of Projection: Orthographic, Isometric Dimensioning of View. Third View Prediction, Primary and Successive Auxiliary Views. Intersections of Surfaces and Bodies. Development of Surfaces. Sectioning. Introduction to Assembly Drawings. Introduction to computer graphics, Engineering Applications.

3. Course Outcomes

CO1	Know the sketching skills and drawing techniques and implement orthographic projection.
CO2	Implement pictorial drawing and carry out sectioning for different types of objects.
CO3	Use computer drawing (AutoCAD software) .

4. Teaching Methods and Strategies

☐	Lectures.	☐	practical projects.
☐	Exercises,	☐	Positive participation/interaction by students.
☐	Discussion Circles.	☐	Different/Interactive illustration Shows
☐	Group work/projects.	☐	Experiments: Laboratory / Field.
☐	Presentations by students.	☐	Field Visits
☐	Reports: Simple / Comprehensive.		
☐	Computer software/application		

5. Learning Resources

Text Book	Cecil H Jensen, Jay D Helsel, Dennis R Short, Engineering Drawing & Design (2007), Edition Number7, 966 pages, Publisher: McGraw-Hill Higher Education
References	James Wedding P.E., Scott McEachron, "Mastering AutoCAD Civil 3D (2009), 912 pages	PDF	21,3 MB, Wiley Publishing, Inc.

Chemical engineering department

Course Description

Principles of Chemical Engineering I	أساسيات الهندسة الكيميائية I

Program/Department	Chemical Engineering Program	Code	CHE

1. General Information

Course Code	CHE 211 - 3
Course Title	Principles of Chemical Engineering I
Credit Hours	3 (3,0)
Pre -requisites	CHEM 103, PHYS 105
Co-requisites	
Level	5th
Language	

2. Course Description

Introduction of chemical Engineering. The job nature of chemical engineers along with the historical development of chemical industries. Nature and classification of chemical industries. Engineering Calculations: Units and dimensions, Unit analysis and transformation, SI system for units, non-dimensional unit analysis, dimensions homogeneity, non-dimensional Numbers, data representation and analysis. Components and variables expression: Mass, volume, flow rates, moles, molecular weight, mass fraction, mole fraction, molecular weight for mixture, pressure and temperature. Material balance: process classification (*batch or continuous*) material balance calculations, material balance for multi-unit processes. Calculation of material balance for recycling, by-passing and side-stream processes. Material balance for chemical processes considering chemical equations and stoichiometric. Material balance for combustion reactions, single-phase systems, and multi-phase systems.

3. Course Outcomes

CO1	Able to understand the role of Chemical Engineers and the difference between Chemical Engineers and chemists and able to convert quantities from one set of units to another.
CO2	Define and determine properties of process streams including fluid density, flow rate, chemical composition (mass and mole fractions, concentrations), fluid pressure, and temperature.
CO3	Draw and label process flowcharts from verbal process descriptions. Carry out degrees of freedom analyses.
CO4	Perform pressure-volume-temperature calculations for ideal and non-ideal gases. Incorporate the results of these calculations into material balance calculations.
CO5	Able to perform material balances on single and multiple units with recycle and by-pass for reactive processes and perform combustion reaction's calculations.

4. Teaching Methods and Strategies

☐	Lectures.	☐	practical projects.
☐	Exercises,	☐	Positive participation/interaction by students.
☐	Discussion Circles.	☐	Different/Interactive illustration Shows
☐	Group work/projects.	☐	Experiments: Laboratory / Field.
☐	Presentations by students.	☐	Field Visits
☐	Reports: Simple / Comprehensive.		
☐	Computer software/application		

5. Learning Resources

Text Book	" Elementary Principles of Chemical Processes ", by Richard M. Felder & Ronald W. Rousseau, J. Wiley, 2004.
References	

جامعة نجران
NAJRAN UNIVERSITY

Chemical engineering department

Course Description

Fundamentals of Electric Circuits	أساسيات الدوائر الكهربائية

Program/Department	Chemical Engineering Program	Code	EE

1. General Information

Course Code	**EE 211-3**
Course Title	**Fundamentals of Electric Circuits**
Credit Hours	**3 (3,0, 0)**
Pre -requisites	**MATH106, PHYS105**
Co-requisites	
Level	**5th**
Language	

2. Course Description

Basic circuit elements and concepts; basic laws of circuit theory: Ohm's law, Kirchoff's law; circuit theorems: the superposition principle, Thevenin and Norton theorems; maximum power transfer theorem Techniques of circuit analysis: Nodal and mesh analysis; Sinusoidal sources and the concept of phasor in circuit analysis; Introduction to the concepts of average, reactive, complex power and power factor**.**

3. Course Outcomes

CO1	Analyze electrical circuits and know their values and units.
CO2	Measure the different quantities in a basic electrical circuit to prove the basic electrical theories

4. Teaching Methods and Strategies

☐	Lectures.	☐	practical projects.
☐	Exercises,	☐	Positive participation/interaction by students.
☐	Discussion Circles.	☐	Different/Interactive illustration Shows
☐	Group work/projects.	☐	Experiments: Laboratory / Field.
☐	Presentations by students.	☐	Field Visits
☐	Reports: Simple / Comprehensive.		
☐	Computer software/application		

5. Learning Resources

Text Book	"Introductory Circuit Analysis", by Boylestad, Prentice Hall, 1999. cuits (6th Ed.)", by James W. Nilsson and Susan A. Riedel, Addison Wesley "Engineering Circuit Analysis (6th ed.)" by W.H. Hayt, J.E. Kemmerly, and S. Durbin
References	"Electronic Devices and Circuit Theory (7th ed.)" by R. Boylestad and L. Nashelsky

Kingdom of Saudi Arabia
Ministry Of Higher Education
Najran University
College of engineering

المملكة العربية السعودية
وزارة التعـــليم العــالي
جامـــعـــة نجـــران
كـــليــة الهنـــدسة

جامعة نجران

Chemical engineering department

Course Description

Physical Chemistry	الكيمياء الفيزيائية

Program/Department	Chemical Engineering Program	Code	CHEM

1. General Information

Course Code	**CHEM 230-3**
Course Title	**Physical Chemistry**
Credit Hours	**3 (3, 0, 0)**
Pre -requisites	**CHEM 103**
Co-requisites	
Level	**6th**
Language	

2. Course Description

Kinetic theory of gases and deviation of the gas laws from this theory. Deviation study of real gases, and the liquefaction of gases. The first law of thermodynamics and its applications in thermal chemistry, as well as the study of the second law of thermodynamics, and the entropy. Free energy and static equilibrium. Definition of the Third Law of Thermodynamics in terms of the entropy and applications.

3. Course Outcomes

CO1	Recognize the fundamentals of kinetics.
CO2	Apply the first and second laws of thermodynamics and their applications in thermal chemistry.
CO3	Know entropy and its variables and its connection to the third law of thermodynamics

4. Teaching Methods and Strategies

☐	Lectures.	☐	practical projects.
☐	Exercises,	☐	Positive participation/interaction by students.
☐	Discussion Circles.	☐	Different/Interactive illustration Shows
☐	Group work/projects.	☐	Experiments: Laboratory / Field.
☐	Presentations by students.	☐	Field Visits
☐	Reports: Simple / Comprehensive.		
☐	Computer software/application		

5. Learning Resources

Text Book	١- كيمياء الثرموديناميك: العويس، دار الخريجي للنشر والتوزيع. ٢- الكيمياء الفيزيائية: جوردن بارو(مترجم)، الدار الدولية للنشر والتوزيع
References	"Basic Chemical Thermodynamics", by E.B Smith (Oxford)

Kingdom of Saudi Arabia
Ministry Of Higher Education
Najran University
College of engineering

جامعة نجران
NAJRAN UNIVERSITY

المملكة العربية السعودية
وزارة التعـــــليم العـــالي
جامـــعـــة نجــــران
كــــليــــة الهنـــــدسة

Chemical engineering department

Course Description

Engineering Mechanics	الميكانيكا الهندسية

Program/Department	Chemical Engineering Program	Code	GE

1. General Information

Course Code	**GE 101-3**
Course Title	**Engineering Mechanics**
Credit Hours	**3 (3, 0, 0)**
Pre -requisites	**MATH 107**
Co-requisites	
Level	**6th**
Language	

2. Course Description

Basic concepts and principles of statics and dynamics. Newton's law, Vector operations. Equilibrium of a particle in two and three dimensions. Definition of moment and couple; reduction of systems forces; equilibrium of rigid bodies; structures including beams, trusses, frames, and machines; internal forces; shear force and bending moment diagrams in beams; friction and its applications, centroid and center of gravity of lines, areas, and volumes; moment of inertia and radius of gyration. Kinematics of particles, kinematics of plane rigid bodies, equations of motion, work and energy.

3. Course Outcomes

CO1	Make force vectors analysis and to solve the equilibrium equations of a particle and a rigid body.
CO2	Apply the general ideas of structural analysis and internal force and friction.
CO3	Locate the center of gravity and centroids for a body, and to determine the moments of inertia.
CO4	Develop strategies to analyze the dynamics of particles and rigid bodies.

3. Teaching Methods and Strategies

☐	Lectures.	☐	practical projects.
☐	Exercises,	☐	Positive participation/interaction by students.
☐	Discussion Circles.	☐	Different/Interactive illustration Shows
☐	Group work/projects.	☐	Experiments: Laboratory / Field.
☐	Presentations by students.	☐	Field Visits
☐	Reports: Simple / Comprehensive.		
☐	Computer software/application		

4. Learning Resources

Text Book	"Engineering Mechanics (Statics)", by Hibbeler, R. C. Publisher: Prentice Hall, 12 edition (2009)
References	D. Gross, W. Hauger, J. Schroder , W. A. Wall and N. Rajapakse Springer, 2009 F. Beer, E. R. Johnston, E. Eisenberg and D. Mazurek Seventh Edition, Mc Graw Hill Higher, 2004

Kingdom of Saudi Arabia
Ministry Of Higher Education
Najran University
College of engineering

المملكة العربية السعودية
وزارة التعــــليم العـــالي
جامـــعـــة نجـــران
كـــلـيـــة الهنـــــدسة

Chemical engineering department

Course Description

Principles of Chemical Engineering II	أساسيات الهندسة الكيميائية **II**

Program/Department	Chemical Engineering Program	Code	CHE

1. General Information

Course Code	**CHE 223**
Course Title	**Principles of Chemical Engineering II**
Credit Hours	**3 (3,0)**
Pre -requisites	**CHE221**
Co-requisites	
Level	**5th**
Language	

2. Course Description

Forms of energy and latent heat. Energy balance for closed systems, energy balance for open systems, Analysis of thermodynamic data tables. Energy balance for processes with and without chemical reactions; elements of energy balance calculations, material and energy balances for solution mixing operations, energy balances considering heat of reaction, heat of formation, heat of combustion.

3. Course Outcomes

CO1	Able to identify, use and convert various forms of energy
CO2	Able to use tabulated energy-related data.
CO3	Able to perform energy balances on non-reactive systems.
CO4	Able to perform energy balances on reactive systems.
CO5	Able to understand and perform energy balance calculations on combustion reactions.

4. Teaching Methods and Strategies

☐	Lectures.	☐	practical projects.
☐	Exercises,	☐	Positive participation/interaction by students.
☐	Discussion Circles.	☐	Different/Interactive illustration Shows
☐	Group work/projects.	☐	Experiments: Laboratory / Field.
☐	Presentations by students.	☐	Field Visits
☐	Reports: Simple / Comprehensive.		
☐	Computer software/application		

5. Learning Resources

Text Book	"Elementary Principles of Chemical Processes ", by Richard M. Felder & Ronald W. Rousseau, J. Wiley, 2004.
References	

Kingdom of Saudi Arabia
Ministry Of Higher Education
Najran University
College of engineering

جامعة نجران
NAJRAN UNIVERSITY

Chemical engineering department

المملكة العربية السعودية
وزارة التعــــليم العـــالي
جامـــــعــــة نجـــــران
كـــــليـــــة الهنـــــدسة

Course Description

Chemical Engineering Thermodynamics	الديناميكا الحرارية للهندسة الكيميائية

Program/Department	**Chemical Engineering Program**	**Code**	**CHE**

1. General Information	
Course Code	**CHE 221**
Course Title	**Chemical Engineering Thermodynamics**
Credit Hours	**3 (3,0,0)**
Pre -requisites	**CHE 211, MATH 203**
Co-requisites	**CHEM 230**
Level	**6th**
Language	

2. Course Description
Introduction to fundamental principles of classical thermodynamics. The first and second laws of thermodynamics are studied in detail. Materials covered include concepts of energy, enthalpy, and heat effects. Interaction between heat transfer, mechanical work, and chemical energy liberation, equations of state, and behavior of gases and liquids. Standard heat of reaction, formation and combustion and entropy. Applications to modeling and analysis of physical and chemical processes undergoing change.

3. Course Outcomes	
CO1	Define internal energy, kinetic energy, potential energy, work ,and heat.
CO2	Define the first law of thermodynamics
CO3	Apply the first law of thermodynamics to closed system for nonreactive and reactive processes
CO4	Apply the first law of thermodynamics to open system for nonreactive and reactive processes
CO5	Apply the second law of thermodynamics.

4. Teaching Methods and Strategies			
☐	Lectures.	☐	practical projects.
☐	Exercises,	☐	Positive participation/interaction by students.
☐	Discussion Circles.	☐	Different/Interactive illustration Shows
☐	Group work/projects.	☐	Experiments: Laboratory / Field.
☐	Presentations by students.	☐	Field Visits
☐	Reports: Simple / Comprehensive.		
☐	Computer software/application		

5. Learning Resources	
Text Book	"Introduction to Chemical Engineering Thermodynamics", 7th Edition, by: J. C. Smith, H. C. Van Ness and M. M. Abott, (2001).
References	"Chemical, Biochemical, and Engineering Thermodynamics", 4th Edition, by Sandler, (2006).

Chemical engineering department

Course Description

Fluid Mechanics	ميكانيكا الموائع

Program/Department	Chemical Engineering Program	Code	CHE

1. General Information	
Course Code	**CHE 222**
Course Title	**Fluid Mechanics**
Credit Hours	**3 (3,0)**
Pre -requisites	**MATH 204-3**
Co-requisites	
Level	**6th**
Language	

2. Course Description
Characteristics of fluids including Newtonian and Non-Newtonian fluids. Pressure and fluid statics in immersed surfaces. The continuity equation including mass balance. Energy balance and momentum balance. The Bernoulli equation. Analysis of pipe flow including laminar and turbulent flows. Analysis of pipe flow in orifice, nozzle and Venturi systems. Fluid flow in packed and fluidized beds. Navier-Stokes equation and its applications. Boundary layer flow.

3. Course Outcomes	
CO1	Understand fluid properties and types of fluid flow.
CO2	Apply the continuity equation and the Bernoulli equation to various flow systems.
CO3	Apply the momentum and energy balances related to fluid flow.
CO4	Analyse fluid flow through solid surfaces, packed beds and fluidized beds.
CO5	Apply and solve the Navier-Stokes equations

4. Teaching Methods and Strategies			
☐	Lectures.	☐	practical projects.
☐	Exercises,	☐	Positive participation/interaction by students.
☐	Discussion Circles.	☐	Different/Interactive illustration Shows
☐	Group work/projects.	☐	Experiments: Laboratory / Field.
☐	Presentations by students.	☐	Field Visits
☐	Reports: Simple / Comprehensive.		
☐	Computer software/application		

5. Learning Resources	
Text Book	"Fundamentals of Fluid Mechanics," Sixth Edition, by Munson, 2010
References	"Fluid Mechanics for Chemical Engineers", by Noel de Nevers, McGraw-Hill, New York (1991).

Kingdom of Saudi Arabia
Ministry Of Higher Education
Najran University
College of engineering

المملكة العربية السعودية
وزارة التعـــــليم العـــالي
جامـــعــــــة نجــــــران
كـــليـــــة الهنـــــــدسة

Chemical engineering department

Course Description

Computer Programming for Engineers	برمجة الحاسب للمهندسين

Program/Department	Chemical Engineering Program	Code	GE

1. General Information	
Course Code	**GE 204-3**
Course Title	**Computer Programming for Engineers**
Credit Hours	**3 (3,0)**
Pre -requisites	**MATH106**
Co-requisites	
Level	**6th**
Language	

2. Course Description

Computer Algorithms; Developing Algorithms; Programming Preliminaries; Simple Computer Programs; Numeric Constants and Variables; Arithmetic Expressions; Input and Output in C Programs; Conditional statements; Implementing loops in Programs; Defining and Manipulation Arrays; Logical Expressions and Control statements; C Programs Examples; Functions; Enumerated data Type and stacks; Structures; Pointer Data Type and its Applications; Lists and Trees; Recursion; Bit level Operations and Applications; Files in C; Miscellaneous Features of C.

3. Course Outcomes

CO1	Know basic computer programming concepts.
CO2	Write programs in the C language.
CO3	
CO4	

4. Teaching Methods and Strategies

☐	Lectures.	☐	practical projects.
☐	Exercises,	☐	Positive participation/interaction by students.
☐	Discussion Circles.	☐	Different/Interactive illustration Shows
☐	Group work/projects.	☐	Experiments: Laboratory / Field.
☐	Presentations by students.	☐	Field Visits
☐	Reports: Simple / Comprehensive.		
☐	Computer software/application		

5. Learning Resources

Text Book	"Computer Programming in C" by V. RAJARAMAN Eastern Economy Edition.
References	

Chemical engineering department

Course Description

Analytical Chemistry	الكيمياء التحليلية

Program/Department	Chemical Engineering Program	Code	CHEM

1. General Information

Course Code	CHEM 311-3
Course Title	Analytical Chemistry
Credit Hours	4 (3,0,1)
Pre -requisites	CHEM 103, CHEM 245
Co-requisites	
Level	7th
Language	

2. Course Description

Basics and classical methods of chemical analysis by titration, such as: Acid/Base titration, Oxidation/Reduction titration, and precipitation titration. Chemical analysis by chromatography, such as: Paper Chromatography *(PC),* Thin Layer Chromatography *(TLC),* Gas Chromatography *(GC),* and High Performance Liquid Chromatography *(HPLC).* **S**pectrometric chemical analysis using specific instruments, such as: Infrared *(IR)* Spectroscopy, Ultra Violet *(UV)* Spectroscopy, Atomic Absorption Spectroscopy *(AAS),* Mass Spectroscopy *(MS),* Nuclear Magnetic Resonance *(NMR) and* Fourier Transform Infrared *(FTIR).* Elemental analysis, such as: Particular elemental analysis *(eg. Mercury analysis),* elemental organic, analysis of total nitrogen, analysis of total organic carbon *(TOC)* and analysis of total organic sulphur *(TOS).*

3. Course Outcomes

CO1	Understand the classical methods of titrimetric chemical analysis.
CO2	Know the techniques of chromatography for chemical analysis
CO3	Acquire the skills of instrumental chemical analysis.
CO4	Ability to perform analysis of specific chemical content using elemental chemical analysis.

4. Teaching Methods and Strategies

☐	Lectures.	☐	practical projects.
☐	Exercises,	☐	Positive participation/interaction by students.
☐	Discussion Circles.	☐	Different/Interactive illustration Shows
☐	Group work/projects.	☐	Experiments: Laboratory / Field.
☐	Presentations by students.	☐	Field Visits
☐	Reports: Simple / Comprehensive.		
☐	Computer software/application		

5. Learning Resources

Text Book	"Vogel's Quantitative Chemical analysis", 6th Edition, by: *Mendham J., Denney R. C., Barrnes J. D. and Thomas M. J. K., (2000).*
References	"Chemical Analysis: Modern Instrumentation Methods and Techniques", 6th Edition, by: *Francic Rouessac and Annick Rouessac, (2004).*

Kingdom of Saudi Arabia
Ministry Of Higher Education
Najran University
College of engineering

جامعة نجران
NAJRAN UNIVERSITY

المملكة العربية السعودية
وزارة التعـــــليم العـــالي
جامـــعـــة نجـــــران
كـــلــيـــة الهنـــــــدسة

Chemical engineering department

Course Description

Mass Transfer	انتقال الكتلة

Program/Department	Chemical Engineering Program	Code	PHYS

1. General Information

Course Code	**CHE 314 -3**
Course Title	**Mass Transfer**
Credit Hours	**3 (3,0)**
Pre -requisites	**MATH 204, CHE 221, CHE 223**
Co-requisites	
Level	**7th**
Language	

2. Course Description

Fundamentals of mass transfer. Steady-state and unsteady-state molecular diffusion including convective mass transfer. Mass transfer equipment. Interphase equilibrium and correlations for convective mass transfer coefficients. Analysis of vapor liquid equilibrium.

3. Course Outcomes

CO1	Estimate values of molecular diffusion coefficients and predict the effect of temperature and pressure on molecular diffusion coefficients
CO2	Estimate molar/mass flux and concentration profiles for steady-state and unsteady-state molecular diffusion
CO3	Calculate convective mass transfer coefficients on a flat plate.
CO4	Estimate convective mass transfer coefficients for a number of situations using empirical correlations.
CO5	Use varios vapor liquid equilibrium diagrams and perform flash calculations for binary and multi-component systems

4. Teaching Methods and Strategies

☐	Lectures.	☐	practical projects.
☐	Exercises,	☐	Positive participation/interaction by students.
☐	Discussion Circles.	☐	Different/Interactive illustration Shows
☐	Group work/projects.	☐	Experiments: Laboratory / Field.
☐	Presentations by students.	☐	Field Visits
☐	Reports: Simple / Comprehensive.		
☐	Computer software/application		

5. Learning Resources

Text Book	"Fundamentals of Heat and Mass Transfer 6th Edition," by Incropera, 2006
References	"Transport Processes and Separation Process Principles", by Geankoplis, 2003 "Fundamentals of Momentum, Heat, and Mass Transfer", by J.R. Welty, C.E. Wicks, R.E. Wilson, and G. L. Rorrer, 4th Ed., John Wiley & Sons, New York (2001)

Kingdom of Saudi Arabia
Ministry Of Higher Education
Najran University
College of engineering

المملكة العربية السعودية
وزارة التعـــــليم العـــالي
جامـــعــــة نجــــران
كــــليـــة الهنـــــدسة

Chemical engineering department

Course Description

Industrial Safety	السلامة الصناعية

Program/Department	Chemical Engineering Program	Code	CHE

1. General Information

Course Code	**CHE 311- 3**
Course Title	**Industrial Safety**
Credit Hours	**3 (3,0)**
Pre -requisites	**CHE 223**
Co-requisites	
Level	**7th**
Language	

2. Course Description

Safety practices related to personnel and environment in industry. Lab and plant safety and first aid. Hazard identification, assessment and prevention. Waste characterization and management. Measures of fire prevention and fire fighting. Emergency incident preparedness.

3. Course Outcomes

CO1	Acquire the principles of safety in work environment.
CO2	Learn first incident preparedness and aid measures.
CO3	Learn types of hazard and hazards classification.
CO4	Learn types of waste and waste handling.
CO5	Acquire skills for incident reporting and form filling.

4. Teaching Methods and Strategies

☐	Lectures.	☐	practical projects.
☐	Exercises,	☐	Positive participation/interaction by students.
☐	Discussion Circles.	☐	Different/Interactive illustration Shows
☐	Group work/projects.	☐	Experiments: Laboratory / Field.
☐	Presentations by students.	☐	Field Visits
☐	Reports: Simple / Comprehensive.		
☐	Computer software/application		

5. Learning Resources

Text Book	
References	" Industrial Safety and Health Management ", by Ray,C.,Prentice Hall, 1998. " Safety , Healthy and Environmental Protection ", by Wuntz,C.A.,Mc Graw Hill, 1998 .

Kingdom of Saudi Arabia
Ministry Of Higher Education
Najran University
College of engineering

المملكة العربية السعودية
وزارة التعــــليم العــالي
جامــعــــة نجـــران
كـــليــــة الهنـــــدسة

جامعة نجران
NAJRAN UNIVERSITY

Chemical engineering department

Course Description

Heat Transfer	انتقال الحرارة

Program/Department	Chemical Engineering Program	Code	CHE

1. General Information

Course Code	**CHE 312 - 3**
Course Title	**Heat Transfer**
Credit Hours	**3 (3,0)**
Pre -requisites	**CHE 222, CHE 223**
Co-requisites	
Level	**7th**
Language	

2. Course Description

Introduction and mechanisms of heat transfer. Conduction, convection and radiation modes of heat transfer. Steady state heat conduction analysis including heat transfer through fixed and variable area. Steady state heat transfer in solids and heterogeneous materials. Calculation of heat transfer coefficients. Heat transfer during phase change such as in boiling and condensation

3. Course Outcomes

CO1	Define the three modes of heat transfer; conduction, convection, and radiation.
CO2	Calculate heat transfer rates for single and composite walls
CO3	Calculate the optimal thickness of insulation.
CO4	Calculate temperature distribution for steady state systems
CO5	Learn different types of heat exchangers

4. Teaching Methods and Strategies

☐	Lectures.	☐	practical projects.
☐	Exercises,	☐	Positive participation/interaction by students.
☐	Discussion Circles.	☐	Different/Interactive illustration Shows
☐	Group work/projects.	☐	Experiments: Laboratory / Field.
☐	Presentations by students.	☐	Field Visits
☐	Reports: Simple / Comprehensive.		
☐	Computer software/application		

5. Learning Resources

Text Book	"Fundamentals of Heat and Mass Transfer 6th Edition", by Incropera, 2006
References	"Transport Processes and Separation Process Principles", by Geankoplis, 2003 "Fundamentals of Momentum, Heat, and Mass Transfer", by J.R. Welty, C.E. Wicks, R.E. Wilson, and G. L. Rorrer, 4th Ed., John Wiley & Sons, New York (2001)

Kingdom of Saudi Arabia
Ministry Of Higher Education
Najran University
College of engineering

جامعة نجران
NAJRAN UNIVERSITY

المملكة العربية السعودية
وزارة التعــــليم العــالي
جامــــعــــة نجـــــران
كــــليــــة الهنــــــدسة

Chemical engineering department

Course Description

Phase and Chemical Equilibria	التوازن الكيميائي والمرحلي

Program/Department	Chemical Engineering Program	Code	CHE

1. General Information

Course Code	CHE 313 - 3
Course Title	Phase and Chemical Equilibria
Credit Hours	3 (3,0)
Pre -requisites	CHE 221
Co-requisites	
Level	7th
Language	

2. Course Description

Application of thermodynamic principles to systems of variable composition, including the study of phase and chemical equilibria. Fluid properties estimation. Criteria for thermodynamic equilibrium. Gibbs free energy and fugacity and activity coefficient models. Single and mixture phase equilibria including the vapour, liquid, and solid states. Chemical reaction equilibrium including homogeneous and heterogeneous reactions, as well as multi-reaction equilibria.

3. Course Outcomes

CO1	Analyse equilibrium and stability in one-component systems
CO2	Analyse the thermodynamics of multi-component mixtures
CO3	Estimate of the Gibbs free energy and fugacity of a component in a mixture
CO4	Analyse phase equilibrium in mixtures
CO5	Analyse chemical equilibrium and the balance equations for chemically reacting systems

4. Teaching Methods and Strategies

☐	Lectures.	☐	practical projects.
☐	Exercises,	☐	Positive participation/interaction by students.
☐	Discussion Circles.	☐	Different/Interactive illustration Shows
☐	Group work/projects.	☐	Experiments: Laboratory / Field.
☐	Presentations by students.	☐	Field Visits
☐	Reports: Simple / Comprehensive.		
☐	Computer software/application		

5. Learning Resources

Text Book	"Chemical, Biochemical, and Engineering Thermodynamics", 4th Edition, by Sandler, 2006
References	" Introduction of Chemical Engineering Thermodynamics, 7/e", by J.C. Smith , H.C. Van Ness,and M.M.Abbot, McGraw-Hill (2001)

Kingdom of Saudi Arabia
Ministry Of Higher Education
Najran University
College of engineering

جامعة نجران
NAJRAN UNIVERSITY

المملكة العربية السعودية
وزارة التعــــليم العــالي
جامـــعـــة نجـــران
كـــليــة الهنــــدسة

Chemical engineering department

Course Description

Engineering Economy	الاقتصاد الهندسي

Program/Department	Chemical Engineering Program	Code	GE

1. General Information

Course Code	GE 306-2
Course Title	Engineering Economy
Credit Hours	2(2, 0)
Pre -requisites	None
Co-requisites	
Level	7th
Language	

2. Course Description

Introduction to engineering economics. Interest formulas and equivalence. Basis for comparison of alternatives. Decision making among alternatives. Evaluating replacement alternatives. Break-even and minimum-cost analysis. Cost accounting. Depreciation. Economic analysis of operations. Economic analysis of public projects.

3. Course Outcomes

CO1	Make comparison of alternatives and decision making among alternatives
CO2	Perform break-even and minimum cost analysis
CO3	Calculate depreciation and execute a complete economics analysis for an operation.

4. Teaching Methods and Strategies

☐	Lectures.	☐	practical projects.
☐	Exercises,	☐	Positive participation/interaction by students.
☐	Discussion Circles.	☐	Different/Interactive illustration Shows
☐	Group work/projects.	☐	Experiments: Laboratory / Field.
☐	Presentations by students.	☐	Field Visits
☐	Reports: Simple / Comprehensive.		
☐	Computer software/application		

5. Learning Resources

Text Book	"Principles of Engineering Economics Analysis", III edition. By White, Agee and case
References	

Kingdom of Saudi Arabia
Ministry Of Higher Education
Najran University
College of engineering

جامعة نجران
NAJRAN UNIVERSITY

المملكة العربية السعودية
وزارة التعـــــليم العـــالي
جامـــعــــة نجـــــران
كــــليـــة الهنــــــدسة

Chemical engineering department

Course Description

Chemical Engineering Lab 1	معمل الهندسة الكيميائية ١

Program/Department	Chemical Engineering Program	Code	CHE

1. General Information

Course Code	CHE 315 - 2
Course Title	Chemical Engineering Lab 1
Credit Hours	2 (0,2)
Pre -requisites	ENGL 107, CHE 222, CHE223
Co-requisites	
Level	7th
Language	

2. Course Description

Laboratory course with experiments involving fluid-flow operations, convection and conduction heat-transfer phenomena, heat transfer operation in heat exchangers, and filtration operations. The experiments are intended to illustrate selected theoretical concepts learned in other courses. Students collect and analyse data, and present findings in the form of formal reports.

3. Course Outcomes

CO1	Calculate and measure pressure drop, friction factors, and volumetric flow rates in fluid-flow systems.
CO2	Calculate heat transfer coefficients and thermal conductivities in gaseous systems undergoing heat transfer and validate their predictive capability.
CO3	Calculate the values of heat-transfer parameters in heat exchangers and validate their predictive capability
CO4	Calculate cake resistance and compressibility coefficients in rotary filters and validate their predictive capability

4. Teaching Methods and Strategies

☐	Lectures.	☐	practical projects.
☐	Exercises,	☐	Positive participation/interaction by students.
☐	Discussion Circles.	☐	Different/Interactive illustration Shows
☐	Group work/projects.	☐	Experiments: Laboratory / Field.
☐	Presentations by students.	☐	Field Visits
☐	Reports: Simple / Comprehensive.		
☐	Computer software/application		

5. Learning Resources

Text Book	"Laboratory Manual, Chemical Engineering Laboratory I" "Transport Processes and Separation Process Principles", by Geankoplis, 2003
References	

Course Description

Separation Processes	عمليات الفصل

Program/Department	**Chemical Engineering Program**	**Code**	**CHE**
e			
Course Code	**CHE 321 - 3**		
Course Title	**Separation Processes**		
Credit Hours	**3 (3,0)**		
Pre -requisites	**CHE 312**, **CHE 313**, **CHE 314**		
Co-requisites			
Level	**8th**		
Language			

2. Course Description

Distillation columns and their process calculations. Analysis of binary distillation in trayed towers: Lewis and McCabe-Thele method. Determination of the stripping section operating line (SOL), Analysis of binary distillation by Ponchon-Savarit method. Stepwise procedure to determine the number of theoretical trays. Introduction to multicomponent distillation liquid-liquid and solid-liquid extraction. Absorption processes and strippers.

3. Course Outcomes

CO1	Perform vapor-liquid equilibrium calculations
CO2	Perform mass and energy balances
CO3	Solve distillation problems using Lewis and McCabe- Thiele methods
CO4	Solve multi-component distillation problems using shortcut methods
CO5	Solve batch distillation problems
CO6	Design absorbers and strippers

4. Teaching Methods and Strategies

☐	Lectures.	☐	practical projects.
☐	Exercises,	☐	Positive participation/interaction by students.
☐	Discussion Circles.	☐	Different/Interactive illustration Shows
☐	Group work/projects.	☐	Experiments: Laboratory / Field.
☐	Presentations by students.	☐	Field Visits
☐	Reports: Simple / Comprehensive.		
☐	Computer software/application		

5. Learning Resources

Text Book	"Separation Process Principles", by Henley, 2011
References	"Separation Process Engineering", by Phillip C. WankatPrentic Hall, New Jersey (1988) "Transport Processes and Separation Process Principles", by Geankoplis, 2003

Kingdom of Saudi Arabia		المملكة العربية السعودية
Ministry Of Higher Education	جامعة نجران	وزارة التعـــــليم العـــالي
Najran University	NAJRAN UNIVERSITY	جامـــعـــة نجـــران
College of engineering		كـــليـــة الهنـــــدسة

Chemical engineering department

Course Description

Kinetics and Reactors design	علم الحركة وتصميم المفاعلات

Program/Department	Chemical Engineering Program	Code	CHE

1. General Information

Course Code	CHE 322 - 3
Course Title	Kinetics and Reactors design
Credit Hours	3 (3, 0)
Pre -requisites	CHE 221, CHEM 230
Co-requisites	
Level	8th
Language	

2. Course Description

Theory of chemical kinetic mechanisms and derivation of overall rate expressions. Analysis and design of ideal batch, mixed, plug and recycle reactors. Analysis of the basics of homogenous kinetics and reactor design, as well as the sizing of isothermal and nonisothermal reactors. Analysis of the basics of solid-catalytic reactions as well as developing an ability to design isothermal packed-bed reactors. Definitions of catalysis and different types of catalytic reactors. Comparison of reactor performance including series, parallel, and multiple reactions. Nonisothermal reactor operation. Basic heterogeneous reactions and non-ideal reactor performance.

3. Course Outcomes

CO1	Interpret batch and differential reactors data to obtain reaction rate expressions.
CO2	Calculate the volume of batch and flow reactors in constant and variable volume systems.
CO3	Calculate yield and selectivity in multiple reactions.
CO4	Analyze heat effects in nonisothermal reactors.
CO5	Define catalysis, classify catalytic reactions and describe steps of the reaction mechanism.

4. Teaching Methods and Strategies

☐	Lectures.	☐	practical projects.
☐	Exercises,	☐	Positive participation/interaction by students.
☐	Discussion Circles.	☐	Different/Interactive illustration Shows
☐	Group work/projects.	☐	Experiments: Laboratory / Field.
☐	Presentations by students.	☐	Field Visits
☐	Reports: Simple / Comprehensive.		
☐	Computer software/application		

5. Learning Resources

Text Book	"Chemical Reaction and Chemical Reactors", by Roberts, 2008
References	"Chemical Reaction Engineering" , by Levenspiel, O., 3rd ed., Wiley, N.Y, 1999. "Elements of Chemical Reaction Engineering", by Fogler, H.S., 4th ed., Prentice Hall, Upper Saddle River, 2005.

Kingdom of Saudi Arabia
Ministry Of Higher Education
Najran University
College of engineering

المملكة العربية السعودية
وزارة التعــــليم العـــالي
جامـــعـــة نجـــران
كــــليــة الهنــــدسة

Chemical engineering department

Course Description

Chemical Engineering Lab 2	معمل الهندسة الكيميائية ٢

Program/Department	Chemical Engineering Program	Code	CHE

1. General Information	
Course Code	**CHE 323 - 2**
Course Title	**Chemical Engineering Lab 2**
Credit Hours	**2 (2,0)**
Pre -requisites	**ENGL 107, CHE 312, CHE 313, CHE 314**
Co-requisites	**CHE 321**
Level	**8th**
Language	

2. Course Description
Laboratory course with experiments involving separation of components from mixtures, including continuous and batch distillation, liquid-liquid extraction and gas absorption. The experiments illustrate selected theoretical concepts learned in other courses. Students collect and analyze data, and present findings in the form of formal reports.

3. Course Outcomes	
CO1	Calculate theoretically and validate experimentally the performance of a continuous distillation process.
CO2	Calculate theoretically and validate experimentally the performance of a batch distillation process.
CO3	Calculate theoretically and validate experimentally the performance of a liquid-liquid extraction process.
CO4	Calculate theoretically and validate experimentally the performance of a gas-absorption extraction process.

4. Teaching Methods and Strategies			
☐	Lectures.	☐	practical projects.
☐	Exercises,	☐	Positive participation/interaction by students.
☐	Discussion Circles.	☐	Different/Interactive illustration Shows
☐	Group work/projects.	☐	Experiments: Laboratory / Field.
☐	Presentations by students.	☐	Field Visits
☐	Reports: Simple / Comprehensive.		
☐	Computer software/application		

5. Learning Resources	
Text Book	
References	"Laboratory Manual, Chemical Engineering Laboratory II" "Transport Processes and Separation Process Principles", by Geankoplis, 2003

Kingdom of Saudi Arabia
Ministry Of Higher Education
Najran University
College of engineering

المملكة العربية السعودية
وزارة التعــــليم العــالي
جامــــعـــة نجــــران
كــــليــــة الهنــــدسة

Chemical engineering department

Course Description

Numerical Methods	الطرق العددية

Program/Department	Chemical Engineering Program	Code	GE

1. General Information	
Course Code	**GE 311 – 3**
Course Title	**Numerical Methods**
Credit Hours	**3 (3, 0)**
Pre -requisites	**MATH204**
Co-requisites	
Level	**8th**
Language	

2. Course Description

Errors, errors analysis. Numerical solutions of nonlinear equations of single variable: fixed-point iteration method, bisection method, false-position method, Newton-Raphson method, secant method. Numerical solution of systems of linear equations: Gauss-Jordon iterative method. Gauss-Jordon iterative method with partial and complete pivoting. Interpolation: Lagrange interpolation formula, divided differences, Newton interpolation, Numerical differentiation. numerical integration. Introduction to the numerical solution of ordinary nonlinear differential equations.

3. Course Outcomes

CO1	Use of numerical methods for finding solutions for linear and nonlinear equations of one variable.
CO2	Explain the application of topics covered in this course such as interpolation, solution of linear system and nonlinear equations for problems in the fields of science, engineering and others.

4. Teaching Methods and Strategies

☐	Lectures.	☐	practical projects.
☐	Exercises,	☐	Positive participation/interaction by students.
☐	Discussion Circles.	☐	Different/Interactive illustration Shows
☐	Group work/projects.	☐	Experiments: Laboratory / Field.
☐	Presentations by students.	☐	Field Visits
☐	Reports: Simple / Comprehensive.		
☐	Computer software/application		

5. Learning Resources

Text Book	"Numerical Analysis", 8th edition, by R. L. Burden and J. D. Faires, 2004.
References	Numerical Methods for Scientists and Engineers", by R W Hamming Courier, Dover Publications.

Kingdom of Saudi Arabia
Ministry Of Higher Education
Najran University
College of engineering

المملكة العربية السعودية
وزارة التعـــــليم العـــالي
جامـــعـــــة نجـــــران
كـــليـــة الهنـــــــدسة

Chemical engineering department

Course Description

Statistics for engineers	الاحصاء

Program/Department	Chemical Engineering Program	Code	GE

1. General Information

Course Code	**GE 312 - 3**
Course Title	**Statistics for engineers**
Credit Hours	**3 (3, 0)**
Pre -requisites	
Co-requisites	
Level	**8th**
Language	

2. Course Description

In this course we will survey of the basic concepts in probability and statistics with engineering applications. Topics include probability, discrete and continuous random variables, estimation, hypothesis testing and linear and multiple regression

3. Course Outcomes

CO1	cover probability
CO2	descriptive statistics
CO3	basic statistical inference (estimation, confidence intervals, one sample, two sample tests)
CO4	regression
CO5	analysis of variance
CO6	experimental design.
CO7	Information on SAS

4. Teaching Methods and Strategies

☐	Lectures.	☐	practical projects.
☐	Exercises,	☐	Positive participation/interaction by students.
☐	Discussion Circles.	☐	Different/Interactive illustration Shows
☐	Group work/projects.	☐	Experiments: Laboratory / Field.
☐	Presentations by students.	☐	Field Visits
☐	Reports: Simple / Comprehensive.		
☐	Computer software/application		

5. Learning Resources

Text Book	D.C. Montgomery and G.C. Runger, Applied Statistics and Probability and Statistics for Engineers, 4th edition
References	J.L. Devore, Probability and Statistics for Engineering and the Sciences, Brooks/Cole

Kingdom of Saudi Arabia
Ministry Of Higher Education
Najran University
College of engineering

جامعة نجران
NAJRAN UNIVERSITY

المملكة العربية السعودية
وزارة التعــــليم العـــالي
جامـــعـــة نجـــران
كـــليـــة الهنـــدسة

Chemical engineering department

Course Description

Chemical process dynamics and control	حركيه و تحكم العمليات الكيميائية

Program/Department	Chemical Engineering Program	Code	CHE

1. General Information

Course Code	**CHE 411 - 3**
Course Title	**Chemical process dynamics and control**
Credit Hours	**3 (3,0)**
Pre -requisites	**CHE 321, CHE 322**
Co-requisites	
Level	**9th**
Language	

2. Course Description

Measurement of process variables and their dynamics. Modelling 1st, 2nd and general-order linear, and non-linear systems. Transfer functions and dynamic process of simple systems. Linearizing non-linear systems. Controller modes (P, PI, and PID) design, stability and tuning. Analysis of closed loop systems.

3. Course Outcomes

CO1	Apply knowledge of mathematics (linearization, Laplace Transform and frequency response) to develop and solve models describing dynamics of chemical processes.
CO2	Develop block- diagram descriptions of processes and control loops.
CO3	Design and evaluate control systems.
CO4	Evaluate the stability of control loops.
CO5	Apply simulation software (such as MATLAB and SIMULINK) to design control loops.

4. Teaching Methods and Strategies

☐	Lectures.	☐	practical projects.
☐	Exercises,	☐	Positive participation/interaction by students.
☐	Discussion Circles.	☐	Different/Interactive illustration Shows
☐	Group work/projects.	☐	Experiments: Laboratory / Field.
☐	Presentations by students.	☐	Field Visits
☐	Reports: Simple / Comprehensive.		
☐	Computer software/application		

5. Learning Resources

Text Book	"Process Dynamics & Control", by Dale E. Seborg, Thomas F. Edgar, and Duncan A. Mellichamp, Wiley, New York (200X), 3nd Edition
References	

Kingdom of Saudi Arabia
Ministry Of Higher Education
Najran University
College of engineering

المملكة العربية السعودية
وزارة التعــــليم العــالي
جامـــعــــة نجـــران
كــليــة الهنـــدسة

Chemical engineering department

Course Description

Chemical Engineering Design	التصميم للهندسة الكيميائية

Program/Department	Chemical Engineering Program	Code	CHE

1. General Information

Course Code	CHE 412-3
Course Title	Chemical Engineering Design
Credit Hours	3(3,0,0)
Pre -requisites	CHE 321
Co-requisites	
Level	9th
Language	

2. Course Description

General engineering skills and judgment needed for the solution of open-ended problems from a technical-economic viewpoint. Design of a project from conception to implementation; including preliminary feasibility studies, preparation of process flow diagrams, process design, preconstruction cost estimates, equipment sizing (design), selection of materials of construction, and analysis of a project. Applications will be in areas such as petroleum, petrochemicals, emerging chemical industries and water desalination.

3. Course Outcomes

CO1	Conduct preliminary feasibility study of the plant design assigned
CO2	Analyse and design process flow diagrams
CO3	Apply safety and environmental rules in the design of units in the plant.
CO4	Integrate the knowledge acquired in different chemical engineering courses in the design of a chemical plant.
CO5	Apply simulation process softwares such as HYSYS, ASPEN.

4. Teaching Methods and Strategies

☐	Lectures.	☐	practical projects.
☐	Exercises,	☐	Positive participation/interaction by students.
☐	Discussion Circles.	☐	Different/Interactive illustration Shows
☐	Group work/projects.	☐	Experiments: Laboratory / Field.
☐	Presentations by students.	☐	Field Visits
☐	Reports: Simple / Comprehensive.		
☐	Computer software/application		

5. Learning Resources

Text Book	Product and Process Design Principles, Third Edition, by Seider et al. Wiley 2010.
References	"Engineering Foundations and problem solving", 5th Edition, by Arvid R. Eide, Ronald Jension, Larry L. Northup, Steven Mickelson, McGraw-Hill, 2008.

Kingdom of Saudi Arabia
Ministry Of Higher Education
Najran University
College of engineering

المملكة العربية السعودية
وزارة التعــــليم العـــالي
جامـــعـــة نجـــران
كـــليـــة الهنـــدسة

جامعة نجران NAJRAN UNIVERSITY

Chemical engineering department

Course Description

Materials of Chemical Engineering	علم المواد

Program/Department	Chemical Engineering Program	Code	CHE

1. General Information

Course Code	**CHE 413 - 3**
Course Title	**Materials of Chemical Engineering**
Credit Hours	**3 (3,0)**
Pre -requisites	**CHM 245**
Co-requisites	
Level	**9th**
Language	

2. Course Description

This course focuses on the fundamentals of structure, energetics, and bonding of materials, that determines the energy, structure, and stability of materials. Descriptions of interacting electrons and atoms. Multiphase equilibria to chemical reactions and magnetism. Symmetry properties of molecules and solids. Structure of complex, disordered, and amorphous materials; and determination of structure through diffraction. Real-world applications include engineered alloys, electronic and magnetic materials, ionic and network solids, and polymers.

3. Course Outcomes

CO1	Learn relationships between microscopic structure and macroscopic mechanical, thermal and electrical properties of materials.
CO2	Learn about thermodynamic behaviour of materials.
CO3	Learn how materials are polarized and how electrons transfer in materials.
CO4	Learn about material applications such as alloys, polymers and semiconductors.
CO5	Demonstrate the skills of materials analysis.

4. Teaching Methods and Strategies

☐	Lectures.	☐	practical projects.
☐	Exercises,	☐	Positive participation/interaction by students.
☐	Discussion Circles.	☐	Different/Interactive illustration Shows
☐	Group work/projects.	☐	Experiments: Laboratory / Field.
☐	Presentations by students.	☐	Field Visits
☐	Reports: Simple / Comprehensive.		
☐	Computer software/application		

5. Learning Resources

Text Book	"Foundations of Materials Science and Engineering", by W.F. Smith and J. Hashemi, 4th or 5th Edition, McGraw Hill
References	" Materials Science and Engineering: An Introduction" by Callister , W. D. Jr.,, 6th ed., New York, 2005." "Materials Science and Engineering", by William D. Callister, 2007☐

Kingdom of Saudi Arabia
Ministry Of Higher Education
Najran University
College of engineering

جامعة نجران
NAJRAN UNIVERSITY

المملكة العربية السعودية
وزارة التعــــليم العــالي
جامــعـــة نجـــران
كـــليـــة الهنـــــدسة

Chemical engineering department

Course Description

Graduation Project 1	مشروع تخرج 1

Program/Department	Chemical Engineering Program	Code	CHE

1. General Information

Course Code	**CHE 491**
Course Title	**Graduation Project 1**
Credit Hours	**2(2,0)**
Pre -requisites	**Level 8**
Co-requisites	
Level	**9th**
Language	

2. Course Description

Apply knowledge from other coursework to a project. The students will choose a specific industry or chemical process, study different aspects of the process, including economics and feasibility, and present a formal report.

3. Course Outcomes

CO1	Develop knowledge of a process and its proposed commercial products.
CO2	Develop a process flow diagram of the process
CO3	Perform mass and energy balance of the process
CO4	Design process units.
CO5	Study the economics of the project, including capital cost

4. Teaching Methods and Strategies

☐	Lectures.	☐	practical projects.
☐	Exercises,	☐	Positive participation/interaction by students.
☐	Discussion Circles.	☐	Different/Interactive illustration Shows
☐	Group work/projects.	☐	Experiments: Laboratory / Field.
☐	Presentations by students.	☐	Field Visits
☐	Reports: Simple / Comprehensive.		
☐	Computer software/application		

5. Learning Resources

Text Book	
References	TBA

Kingdom of Saudi Arabia
Ministry Of Higher Education
Najran University
College of engineering

جامعة نجران
NAJRAN UNIVERSITY

المملكة العربية السعودية
وزارة التعـــليم العـــالي
جامـــعـــة نجــــران
كـــليـــة الهنـــــدسة

Chemical engineering department

Course Description

Management of Engineering Projects	إدارة المشاريع الهندسيه

Program/Department	Chemical Engineering Program	Code	GE

1. General Information

Course Code	GE 407-2
Course Title	Management of Engineering Projects
Credit Hours	2 (2 , 0 , 1)
Pre -requisites	GE 306
Co-requisites	-
Level	9th
Language	

2. Course Description

Characteristics of Construction Industry; project delivery systems; the design and construction process; construction contracting; construction planning; project control, conceptual cost estimation; and Quality and Safety Management.

4. Course Outcomes

CO1	Planning of the construction projects.
CO2	Manage the feasibility studies
CO3	Manage the construction contracting
CO4	Control the construction costing process.
CO5	Planning of safety precautions
CO6	Manage the quality control process for the construction projects

5. Teaching Methods and Strategies

☐	Lectures.	☐	practical projects.
☐	Exercises,	☐	Positive participation/interaction by students.
☐	Discussion Circles.	☐	Different/Interactive illustration Shows
☐	Group work/projects.	☐	Experiments: Laboratory / Field.
☐	Presentations by students.	☐	Field Visits
☐	Reports: Simple / Comprehensive.	☐	
☐	Computer software/application		

6. Learning Resources

Text Book	1. Daniel W. Halpin ,"Construction Management", John Wiley & Sons, New York (2006).
References	

Kingdom of Saudi Arabia
Ministry Of Higher Education
Najran University
College of engineering

جامعة نجران
NAJRAN UNIVERSITY

المملكة العربية السعودية
وزارة التعــــليم العــــالي
جامــــعــــة نجــــران
كــــليــــة الهنــــدسة

Chemical engineering department

Course Description

Nanotechnology	تقنيات النانو

Program/Department	Chemical Engineering Program	Code	CHE

1. General Information

Course Code	**CHE 421 - 3**
Course Title	**Nanotechnology**
Credit Hours	**3 (3, 0)**
Pre -requisites	**CHE 413**
Co-requisites	
Level	**10th**
Language	

2. Course Description

Interdisciplinary nanoscience and nanotechnology course focusing on nanometer and micrometer scale building blocks with a variety of shapes, compositions and surface functionalities and their assembly into functional structures. Synthesis and purification techniques of nanomaterials including quantum dots and one dimensional nanomaterials and their applications in energy-related devices. Toxicity of nanomaterials and their effect on the environment.

3. Course Outcomes

CO1	Learn the chemical, physical and mechanical properties of nano-scaled materials.
CO2	Learn different structures and growth mechanisms of nanomaterials
CO3	Learn different fabrication and analysis techniques involving surface science.
CO4	Learn various applications of nanomaterials.
CO5	Learn about the effects of nanomaterials on environment.

4. Teaching Methods and Strategies

☐	Lectures.	☐	practical projects.
☐	Exercises,	☐	Positive participation/interaction by students.
☐	Discussion Circles.	☐	Different/Interactive illustration Shows
☐	Group work/projects.	☐	Experiments: Laboratory / Field.
☐	Presentations by students.	☐	Field Visits
☐	Reports: Simple / Comprehensive.		
☐	Computer software/application		

5. Learning Resources

Text Book	"An Introduction to Nanoscience and Nanotechnology" by Alain Nouailhat, 2008, John Wiely Interscience.
References	"Fundamentals of Nanotechnology" by Gabor L. Hornyak, John J. Moore, H.F. Tibbals, Joydeep Dutta, 2009, CRC press "Fundamentals of Polymer Engineering", 2 nd Ed. By Anil Kumar and Rakesh Gupta,, (Plastics Engineering), Marcel Dekker, 2003. "Principles of Polymer Engineering" , by N. G. McCrum, C. P. Buckley, and C. B. Bucknall, Oxford Science , 1997.

Kingdom of Saudi Arabia
Ministry Of Higher Education
Najran University
College of engineering

Chemical engineering department

المملكة العربية السعودية
وزارة التعــــليم العـــالي
جامـــعـــة نجـــران
كـــليــة الهنـــدسة

Course Description

Advanced Materials and Energy	المواد المتقدمة والطاقة

Program/Department	Chemical Engineering Program	Code	CHE

1. General Information

Course Code	**CHE 422 - 3**
Course Title	**Advanced Materials and Energy**
Credit Hours	**3 (3,0)**
Pre -requisites	**CHE 321**
Co-requisites	
Level	**10th**
Language	

2. Course Description

Refining and petrochemicals processes. Methods used in oil recovery, oil refining operations such as distillation and catalytic cracking as well as major petrochemical processes. Overview of alternative energy sources such as biofuel, solar, wind power, as well as energy management and storage.

3. Course Outcomes

CO1	Learn different crude oil refining processes.
CO2	Learn various petrochemical processes.
CO3	Learn properties and operation of solar cells, fuel cells, and wind power generation.
CO4	Learn operation of bio-ethanol production.
CO4	Apply tools on statistics and management of energy

4. Teaching Methods and Strategies

☐	Lectures.	☐	practical projects.
☐	Exercises,	☐	Positive participation/interaction by students.
☐	Discussion Circles.	☐	Different/Interactive illustration Shows
☐	Group work/projects.	☐	Experiments: Laboratory / Field.
☐	Presentations by students.	☐	Field Visits
☐	Reports: Simple / Comprehensive.		
☐	Computer software/application		

5. Learning Resources

Text Book	Fundamentals of Renewable Energy Processes, Third Edition, by Aldo Vieira Da Rosa, Academic Press, 2012 Bioethanol production as a liquid fuel from biomass: Strain development of genetically modified bacteria for bioethanol production from biomass , by Young-Jae Jeon, LAP, 2010.
References	"Petroleum and Gas Field Processing (Chemical Industries)**",** by H.K. Abdel-Aal, Mohamed Aggour, and M.A. Fahim, Marcel Dekker, 2003. **"Advances in Petroleum Geochemistry", Vol.1, (Advances in Petroleum Geochemistry)",** by Jim Brooks , Academic Press, Last Edition

Kingdom of Saudi Arabia
Ministry Of Higher Education
Najran University
College of engineering

جامعة نجران
NAJRAN UNIVERSITY

المملكة العربية السعودية
وزارة التعـــــليم العـــالي
جامـــعـــة نجـــران
كـــليــة الهنــــدسة

Chemical engineering department

Course Description

Biology for Engineers	الأحياء للمهندسين

Program/Department	Chemical Engineering Program	Code	CHE

1. General Information

Course Code	**CHE 423 - 3**
Course Title	**Biology for Engineers**
Credit Hours	**3 (3,0)**
Pre -requisites	**None**
Co-requisites	
Level	**10th**
Language	

2. Course Description

This course emphasizes the link between biology and engineering and the interface between them. The contents include the basic knowledge of biological functions of human at the organ, tissue, cellular and molecular level

3. Course Outcomes

CO1	Describe the scope of biomolecular engineering
CO2	Model biomolecular binding interactions and describe applications in biosensing
CO3	Model enzyme kinetics and industrial operation, and measure enzyme kinetics for biofuel applications
CO4	Describe molecular biology techniques for protein engineering
CO5	Describe current approaches in drug delivery and tissue engineering
CO6	Model biomedical transport mechanisms
CO7	Describe applications of nanomaterials in biomolecular engineering
CO8	Describe technologies for manipulating cells

4. Teaching Methods and Strategies

☐	Lectures.	☐	practical projects.
☐	Exercises,	☐	Positive participation/interaction by students.
☐	Discussion Circles.	☐	Different/Interactive illustration Shows
☐	Group work/projects.	☐	Experiments: Laboratory / Field.
☐	Presentations by students.	☐	Field Visits
☐	Reports: Simple / Comprehensive.		
☐	Computer software/application		

5. Learning Resources

Text Book	Campbell Biology (Pearson/Benjamin Cummings Publisher), Reece, Urry, Cain, Wasserman, Minorsky and Jackson , 2011 as 9th Edition
References	

Kingdom of Saudi Arabia
Ministry Of Higher Education
Najran University
College of engineering

Chemical engineering department

المملكة العربية السعودية
وزارة التعـــليم العــالي
جامــعــــة نجــــران
كـــليــة الهنـــــدسة

Course Description

Graduation Project 2	٢ مشروع تخرج

Program/Department	Chemical Engineering Program	Code	CHE

1. General Information

Course Code	**CHE 492**
Course Title	**Graduation Project 2**
Credit Hours	**3 (3,0)**
Pre -requisites	**Level 9**
Co-requisites	
Level	**10th**
Language	

2. Course Description

The students can choose a specific industry or a chemical process, study the different aspects of the process including materials, mass and energy balances, economics and feasibility and present a formal report.

3. Course Outcomes

CO1	Develop a clear Knowledge of a process and the proposed throughout
CO2	Develop a process flow diagram of the process
CO3	Perform mass and energy balance of the process
CO4	Design process units
CO5	Study the economics of the project including capital cost.

4. Teaching Methods and Strategies

☐	Lectures.	☐	practical projects.
☐	Exercises,	☐	Positive participation/interaction by students.
☐	Discussion Circles.	☐	Different/Interactive illustration Shows
☐	Group work/projects.	☐	Experiments: Laboratory / Field.
☐	Presentations by students.	☐	Field Visits
☐	Reports: Simple / Comprehensive.		
☐	Computer software/application		

5. Learning Resources

Text Book	
References	TBA

Kingdom of Saudi Arabia
Ministry Of Higher Education
Najran University
College of engineering

Chemical engineering department

المملكة العربية السعودية
وزارة التعــــليم العــالي
جامـــعـــــة نجــــران
كـــليـــة الهنـــــدسة

Kingdom of Saudi Arabia
Ministry Of Higher Education
Najran University
College of engineering

المملكة العربية السعودية
وزارة التعــــليم العــالي
جامـــعـــــة نجــــران
كـــليـــة الهنـــــدسة