2024- 2025

CHEMICAL ENGINEERING PROGRAM SPECIFICATION

فصول دراسية

Contents

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Chemical Engineering

B.Sc. Program Specification

1.	Basic Information	
1.1	Program title	Chemical Engineering
1.2	Program type	Single
1.3	Department (s)	Chemical Engineering
1.4	Coordinator	Assoc.prof. Hend Elsayed Gadow
1.5	External evaluator(s)	.....
1.6	Last date of program specifications approval	12-2024

2. Professional Information:

2.1 Program Vision

The Chemical Engineering Program strives for regional and international recognition in teaching, research and community service. It enriches the standard of engineering education, continually enhances the quality and competence of graduated students, and stimulates outstanding research activities that contribute to the advancement of the chemical engineering profession and the development of local and regional industry.

2.2 Program Mission

The Chemical Engineering Program produces chemical engineers capable of meeting the technological and societal needs of Damietta government, Egypt and the Arab region. This mission is fulfilled by providing a broad curriculum in the basic sciences, process systems and design, unit operations, and in modern experimental and computing techniques. The program strives for academic excellence through continual assessment of the outcomes. The focus is on petroleum and petrochemical technology, environmental engineering, and water technology, material (foams, ceramics, rubber, plastics, painting and paper) technologies and industries.

3. Attributes of the Graduates of Engineering

The Engineering Graduate must:

3. Attributes
1. Master a wide spectrum of engineering knowledge and specialized skills and can apply acquired knowledge using theories and abstract thinking in real life situations; 2. Apply analytic critical and systemic thinking to identify, diagnose and solve engineering problems with a wide range of complexity and variation; 3. Behave professionally and adhere to engineering ethics and standards; 4. Work in and lead a heterogeneous team of professionals from different engineering specialties and assume responsibility for own and team performance; 5. Recognize his/her role in promoting the engineering field and contribute in the development of the profession and the community; 6. Value the importance of the environment, both physical and natural, and work to promote sustainability principles; 7. Use techniques, skills and modern engineering tools necessary for engineering practice; 8. Assume full responsibility for own learning and self-development, engage in lifelong learning and demonstrate the capacity to engage in post- graduate and research studies; 9. Communicate effectively using different modes, tools and languages with various audiences; to deal with academic/professional challenges in a critical and creative manner; 10. Demonstrate leadership qualities, business administration and entrepreneurial skills.

4.	**Program aims**
The graduates of the chemical engineering program should be able to:	
1	Master a broad range of engineering knowledge and specialized skills, as well as the ability to apply acquired knowledge in real-world situations by applying theories and abstract thinking in analytic critical and systemic thinking to identify, diagnose, and solve engineering problems of varying complexity and variation.
2	Work in and manage a diverse team of professionals from various engineering disciplines, taking responsibility for own and team performance; and Behave professionally and adhere to engineering ethics and standards.
3	Recognize his or her role in promoting engineering and contributing to the profession's and community's development; by appreciating the importance of the environment, both physical and natural, and working to promote sustainability concepts.
4	Use the techniques, skills, and current engineering tools required for engineering practice by taking full responsibility for one's own learning and development, participating in lifelong learning, and demonstrating the ability to pursue postgraduate and research studies.
5	Communicate effectively with a variety of audiences using a variety of forms, methods, and languages; cope with academic and professional issues in a critical and creative manner; and display leadership, business administration, and entrepreneurial abilities.
6	Analyze data from the intended tests to manage resources creatively.
7	Design a system, component, and process to meet recent technological advancements using computer systems in chemical engineering.
8	Consider the impact of chemical process industries on society, economics, and the environment using fundamental knowledge of chemical process industries.
9	Demonstrate current technical expertise by addressing process dynamic and control challenges in plant operations.

10	Apply research findings in chemical reactions to exhibit their properties in order to assess the results and draw conclusions about industrial operations.

5. Competencies of Engineering Graduate

The Engineering Graduate must be able to:

A1. Identify, formulate, and solve complex engineering problems by applying engineering fundamentals, basic science and mathematics.

a1. Describe the relevant mathematical principles and theories in the discipline.
a2. Explain the scientific principles and theories that apply to the topic.
a3. Explain the basic principles of engineering.
b1. Use math ideas and theories that are applicable to the field.
b2. Use scientific concepts and theories that are relevant to the profession.
b3. Apply engineering basics that are relevant to the subject.
c1. Identify complex engineering problems by -applying the concepts and the theories of mathematics
c2. Formulate complex engineering problems by applying the concepts and the theories of sciences, appropriate to the discipline.
c3. Solve complex engineering problems by applying engineering fundamentals.

A2. Develop and conduct appropriate experimentation and/or simulation, analyze and interpret data, assess and evaluate findings, and use statistical analyses and objective engineering judgment to draw conclusions.

a1. Define organic reactions' principles, basic characteristics, and properties, as well as their applications in chemical process industries like petroleum refining, natural gas processing, petrochemicals, electrochemistry, fertilizers, and ceramics, etc.

a2. Define the principles, basic properties, and features of inorganic reactions, as well as their use in chemical process industries such as petroleum refining, natural gas processing, petrochemicals, electrochemistry, fertilizers, and ceramics, etc.

b1. Conduct basic experiments to learn about the basic characteristics and features of organic reactions, for applying in chemical process industries such as petroleum refining, natural gas processing, petrochemicals, electrochemistry, fertilizers, and ceramics, among others.

b2. Conduct basic experiments to learn about the basic properties and features of inorganic reactions, for applying in chemical process industries such as petroleum refining, natural gas processing, petrochemicals, electrochemistry, fertilizers, and ceramics, etc.

b3. Analyze data to interpret it

b4. Evaluate components, systems, and processes are evaluated for their characteristics and performance.

c1. Choose relevant mathematical and computer-based methodologies for problem modeling and analysis.

c2. Develop suitable experimentation and/or simulation.

c3. Apply statistical analyses and objective engineering judgment to draw conclusions.

A3. **Apply engineering design processes to produce cost-effective solutions that meet specified needs with consideration for global, cultural, social, economic, environmental, ethical and other aspects as appropriate to the discipline and within the principles and contexts of sustainable design and development.**

a1. Learn the general principles of design techniques specific to particular products and processes including reactor and vessel design.

a2. Understand the professional ethics and impacts of engineering solutions on society and environment

a3. Recognizes the environmental and economic impact of various industries, waste minimization, and industrial facility remediation.

b1. Judge engineering decisions considering balanced costs, benefits, safety, quality, reliability, and environmental impact.

c1. Incorporate economic, societal, global, environmental, and risk management factors into design.

c2. Apply engineering design procedures to generate cost-effective solutions while adhering to the principles and contexts of sustainable design and development.

A4. Utilize contemporary technologies, codes of practice and standards, quality guidelines, health and safety requirements, environmental issues and risk management principles.

a1. Describe quality assurance systems, codes of practice, and standards, as well as health and safety regulations and environmental concerns.

a2. List the engineering-related business and management principles.

a3. Define contemporary engineering technologies and their applications in relation to disciplines.

b1. Create methodical approaches when dealing with new and advancing technology.

c1. Apply safe systems at work by taking the necessary precautions to manage hazards.

c2. Use fundamental organizational and project management abilities.

c3. Utilize modern technologies.

c4. Apply quality assurance procedures and follow codes and standards.

A5. Practice research techniques and methods of investigation as an inherent part of learning.

a1. Define technical language and report writing.

b1. Assess different ideas, views, and knowledge from a range of sources.

c1. Prepare technical reports

d1. Search for information to engage in lifelong self-learning discipline.

A6. Plan, supervise and monitor implementation of engineering projects, taking into consideration other trades requirements.

a1. Show the conventional procedures of chemical analysis and characterization of common engineering materials and components.

b1. Interpret data derived from laboratory observation from equipment flow sheets, charts and curves to interpret data derived from laboratory observation.

c1. Conduct troubleshooting in chemical engineering plants.

c2. Acquire entrepreneurial skills.

A7. Function efficiently as an individual and as a member of multi-disciplinary and multicultural teams.

d1. Collaborate effectively within multidisciplinary team.
d2. Work in stressful environment and within constraints.
d3. Motivate individuals.

A8. Communicate effectively – graphically, verbally and in writing – with a range of audiences using contemporary tools.

d1. Communicate effectively.

d2. Demonstrate efficient IT capabilities.

A9. Use creative, innovative and flexible thinking and acquire entrepreneurial and leadership skills to anticipate and respond to new situations.

d1. Think creatively in solving problems of design.

d2. Manage effectively for tasks, time and resources.

d3. Refer to relevant literatures.

A10. Acquire and apply new knowledge; and practice self, lifelong and other learning strategies.

d1. Search for information to engage in lifelong self-learning discipline.

d2. Merge the engineering knowledge, understanding, and feedback to improve design, products and/or services.

In addition to the competencies for all engineering programs the basic chemical:
Engineering graduate and similar programs must be able to:

B1. Design a practical chemical engineering system, component or process utilizing a full range of chemical engineering principles and techniques including: Mass and Energy Balance, Thermodynamics, Mass Transfer, Heat Transfer, Momentum Transfer, Kinetics of Chemical Reactions, Reactor Design, Instrumentation and Control of Chemical Processes, and Process and Plant Design.

a1. Recognize the principles of chemical engineering including chemical reaction equilibrium and thermodynamics; mass and energy balance; transport processes; separation processes, mechanical unit operations and process control.

b1. Summarize the appropriate techniques relevant to different industries.

c1. Create a process, component or system to carry out specialized engineering designs.

B2. Engage in the recent technological changes and emerging fields relevant to chemical engineering to respond to the challenging role and responsibilities of a professional chemical engineer

d1 Engage in the recent technological changes and emerging fields relevant to chemical engineering to respond to the challenging role and responsibilities of a professional chemical engineer

B3. Apply numerical modeling methods and/or computational techniques appropriate to chemical engineering.

d1. Apply numerical modeling methods and/or computational techniques appropriate to chemical engineering.

B4. Adopt suitable national and international standards and codes to: design, operate, inspect and maintain chemical engineering systems.

d1. Adopt suitable national and international standards and codes to: design, operate, inspect and maintain chemical engineering systems.

6. Academic standards

The program adopts the National Academic reference standards of chemical engineering program (NARS18) which is approved by the national authority for quality assurance and accreditation of education NAQAAE.

7. Reference standards

External references for standards (Benchmarks)

1. ABET Engineering Criteria 2000.
2. Cleveland State University, Dept. of Chemical Engineering.
3. University of Michigan, Chemical Engineering Dept.

8. Program Curriculum Structure and Contents

8.1 Program duration:

The program duration is five years.

8.2 Program structure:

- **Total hours of the program:** 269 contact hours

- **Theoretical:**139 contact hours
- **Practical/Exercises**: 122 contact hours
- **Compulsory**:245
- **Elective**: 24

Article (166) Study in a two-semester system for a period of five years, with the provision of some elective courses, to develop in the student the ability to think and read externally, and to help in linking the various scientific courses he studies, as well as mastering methods of research, use of the library, self-study, and the field:

The first semester: (Autumn): starts from the third Saturday of September and lasts 15 weeks. The second semester (spring): starts from the second Saturday of February and lasts 15 weeks. Arabic and English are the languages of instruction at the institute, and the exam is taken in the language in which the course is taught.

Article (167) The transfer exams and the final group exam are held at the end of each semester in the courses that the student studied in his group and in the courses that are left behind and imposed on him by lower groups in accordance with schedules of courses mentioned in these regulations.

Article (168): Final year students prepare a bachelor's project, and the relevant department councils determine its topic and allocate an additional four-week period for its implementation after the written exam. The Institute Council decides, based on the proposal of the department councils, how to divide students into groups during the course Implementing projects and how to supervise and discuss them in oral exam sessions and rewards finance for participants in project implementation.

Article (169) The student's success in the academic courses and in the general assessment is estimated by one of the following estimates:

Excellent, 85% or more of the total score

Very good, from 75% to less than 85% of the total score

Good: from 65% to less than 75% of the total score

Acceptable from 50% to less than 65% of the total score

The student is considered to have failed with one of the following two grades in the following cases.

Weak: from 30% to less than 50% of the total score

Very weak: less than 30% of the total score

Written failure: The student is considered to have written failure in the course if he obtains less than 40 the grade assigned to the written exam for that course Article (170)

A - The student is considered successful if he succeeds in all the courses he is assigned to study in his group or if any group is left behind minimum.

B - The student is transferred from the group in which he is enrolled to the next group if he fails or is absent with an acceptable excuse in no more than two courses from his group or from the courses of a lower group, and success in all courses is required before obtaining a bachelor's degree.

C - In addition to the two courses referred to in the previous paragraph, the student who fails a third additional course in humanities is allowed to transfer to the next group.

D – The student takes the exam in the courses he failed with the students of the group in which these courses are taught, or at another date determined by the Institute Council. In this case, their success is considered an acceptable grade. The grades the students obtain will be reduced to the maximum acceptable grade if their grades exceed that.

The grade for the backwardness course exam is calculated on the basis of the written exam grade that the student obtains in addition to the grade for the oral practical test (if any, after assigning it to the high end of the total grades for the course. This text applies to the second round exam (September round for final teams).

Article (171) It shall be held A second round examination in September of each year for final year students who fail no more than two of the courses of this band or lower courses, in addition to a third additional course in the

humanities, if any, with the exception of the bachelor's project, in which the student who fails it becomes left to repeat.

Article (172): The student's work is evaluated continuously during the semester in addition to the end-of-semester exam, and the semester's work represents part of the final grade and is represented in periodic exams, theoretical and practical exercises, research, and regularity. In order for the student to be considered successful, he must obtain at least 50% in his total grades in the course. He must obtain at least 40% of the grades in the final written exam, even if his total grades in the course are higher than the minimum passing threshold.

Article (173): A student enrolled in one of the institute's departments may transfer his enrollment to another department after paying the transfer fees in accordance with the ministerial decision issued regarding the transfer rules, provided that the admission conditions for the transferred department are met. To him as long as he does not achieve 50% of the institute's study requirements.

Article (174): The student who fails more than two academic courses and a third additional course in the humanities is required to repeat the academic year studying and taking an exam in the failing subjects only, and he must continue studying, oral and practical exams, and an exam at the end of the year or the end of the semester with his study group.

Article (175): The final grade for students for the bachelor's degree is calculated on the basis of the total grades for all academic years (from preparatory to the fourth year, and the total obtained by the student is attributed to the total cumulative total for these years). The student receives the following grades according to the grades he obtained:

Excellent general grade for the student who obtains 85% or more of the cumulative total.

Very good general grade for the student who obtains 75% to less than 85% of the cumulative total.

Good general grade for the student who obtains 65% to less than 75% of the cumulative total. General grade.

It is accepted for a student who obtains 50% to less than 65% of the cumulative total.

The student is granted honors if he obtains a general grade of at least very good in all years of study except the preparatory year, with no previous failure in any of the academic subjects in all year groups.

Article (176): The Institute sends to the competent department of the Ministry of Higher Education at least one month before the examination date, lists of three copies with the names of the students who are taking the examination, whether in the transfer examination or the final examination at the Institute - bachelor's degree. The competent department in the Ministry reviews the lists to ensure the validity of the students' registration in the institute and their eligibility. In taking the exam, students who have no right to take the exams are excluded. Then these lists are approved, a copy of them is kept by the administration, another copy is sent to the institute, and a third copy is delivered to the general president of the exam to work accordingly in the end-of-school year exam.

Article (177): The Ministry of Higher Education sends to the Ministry of Higher Education every semester the end-of-semester exam schedules for approval. It also sends the formation of exam committees for approval and lists of graders and examiners for accreditation also.

Article (178): The Institute issues temporary certificates for final-year graduates, which are signed by the Dean of the Institute and include: For the name/graduation course/grades of success in each course and the general grade. The competent examinations department in the ministry reviews and approves the graduates' certificates. The date of granting the degree (bachelor's) is determined from the date the Minister of Education approves the examination result.

Article (179): Transfer exams and final exams are subject to the regulations and rules decided by the Ministry of Higher Education for each private higher institute. The Institute's Board of Directors approves the results of the transfer exams, and the Ministry of Higher Education approves the results of the final exams. Students who successfully complete their studies at the Institute are granted a bachelor's degree, and these certificates are approved by the

Minister of Higher Education. The results of the transfer exams are announced after their approval by the Dean of the Institute, after review by the competent department of the Ministry. The Ministry of Higher Education is notified of a copy of this result. The results of the bachelor's exams are also announced after their approval by the Minister of Higher Education in separate lists for all those who passed their grades and those who failed, mentioning the courses for failure and failure, and the subjects in which they failed, arranged according to the alphabet of the names of the students in each grade. It is announced in a visible place in the institute and for sufficient time to view it.

Article (180) The Institute's Board of Directors may exempt the student from attending all or some of the academic courses and also exempt him from the transfer exams for them, except for the final band courses, if it is proven that he attended equivalent courses and successfully took equivalent exams in engineering colleges and engineering institutes. Debate only.

Article (181): A decision is issued annually by the Minister of Higher Education based on the proposal of the head of the education sector to appoint the head of the final examination year (bachelor's degree at the institute).

The Dean of the institute is considered the general president of the transfer exam, and the general president of the exam is fully responsible for organizing all work related to the exam.

The Dean of the Institute shall be the General Head of Examinations at the Institute, and the competent agent shall be his deputy, and the work committees for examinations shall be formed in accordance with the rules regulating that at the Institute, and this formation shall be approved by the head of the relevant sector. Under his supervision, one or more committees are formed to monitor the exam and prepare the results, each of which is headed by one of the professors or assistant professors.

Every semester, the end-of-semester examination schedules are sent to the Ministry of Higher Education for approval, as well as the formation of examination committees and lists of examiners and graders.

Article (182): The student will be dismissed from the institute if the student stops studying without a prior excuse for a period of two semesters or if he

stops studying for the same period despite the rejection of the excuse provided by the Institute's Board of Directors.

Article (183): A student may not remain in one year for more than two years. In addition to the above, the Institute's Board of Directors may grant students in the second year and beyond two additional opportunities at most to take the exam from abroad. If a student in the final year fails in no more than half of the courses in this year, regardless of the courses acquired from the previous year, he will be granted permission to take the exam until he passes.

Article (184): The student performs the field training approved by the Institute for a period of eight weeks in factories and institutions after completing the second semester exams at the third level. This training aims to link what the student studied at the Institute with practical applications as well as acquiring some skills in the field of specialization. The distribution of the training grade is as follows:

- 30% of the grand final is assigned by the institute supervisor.

- 30% is assigned by the training agency supervisor.

- 40% is assigned to discuss the report submitted by the student.

9. The Reference Frames Determinants for Bachelor Stage

A. Humanities and Social Sciences

Code	Course Name	Contact hour
BAS025	Int. to Engineering and Environment	2
BAS026	Technical English Language 1	4
BAS027	Human Rights	2
BAS114	Technical English Language 2	4
BAS122	Technical Report Writing	4
BAS214	Heritage of Egyptian Literature	2
BAS311	Environmental Management	3
BAS421	Research and Analytic Skills	2
Total		23

B. Business Administration

Code	Course Name	Contact hour
BAS213	Engineering Economy	3
BAS321	Project Management and Control	4
CHE423	Quality Assurance And Engineering Reliability	3
Total		10

C. Mathematics and Basic Sciences

Code	Course Name	Contact hour
BAS011	Mathematics 1	4
BAS012	Mechanics 1	4
BAS013	Physics 1	6
BAS014	Engineering Chemistry	4
BAS016	Int. to Computer Systems	4
BAS021	Mathematics 2	4
BAS022	Mechanics 2	4
BAS023	Physics 2	6
BAS111	Mathematics 3	4
BAS121	Mathematics 4	4
BAS211	Engineering Probability and Statistics	4
BAS221	Numerical Methods in Engineering	4
Total		52

D. Engineering Culture

Code	Course Name	Contact hour
BAS024	Production Engineering	5
BAS112	Electrical Engineering Fundamentals	5
CHE312	Operations Research	4
Total		14

E. Basic Engineering Sciences

Code	Course Name	Contact hour
BAS015	Engineering Drawing and Projection	5
BAS115	Computer programming	4

BAS113	Engineering Thermodynamics	5
BAS124	Strength of materials	4
BAS123	Introduction to information technology	4
BAS212	Fluid Mechanics	4
CHE111	Inorganic Chemistry	4
CHE121	Organic Chemistry	4
CHE122	Physical Chemistry	4
CHE211	Chemical Engineering Principles1	4
CHE212	Material science and metallurgy	4
CHE213	Principles of Engineering Design	4
CHE221	Chemical Engineering Principles 2	5
CHE222	Chemical Engineering Thermodynamics	5
CHE223	Analytical Chemistry	4
CHE224	Process Dynamics and Control	4
CHE225	Heat transfer	5
CHE 315	Electrochemistry	4
Total		**77**

F. Applied Engineering and Design

Code	Course Name	Contact hour
CHE311	Reactor Design	4
CHE313	Mass Transfer Operations I	4
CHE314	Biochemistry	4
CHE316	Elective 1	4
CHE317	Elective 2	4
CHE321	Mass Transfer Operations II	5
CHE322	Corrosion engineering	4
CHE323	Mechanical unit operations	5
CHE324	Process Modeling and Simulation	5
CHE325	Elective 3	4
CHE411	Computer Applications in Chem. Eng.	5

CHE412	Petrochemical Engineering	4
CHE413	Plant Design	5
CHE415	Elective 4	4
CHE416	Elective 5	4
CHE421	Industrial Technology in Chem. Eng.	4
CHE422	Petroleum Refining Engineering	4
CHE425	Elective 6	4
Total		**77**

G. Projects and Practice

Code	Course Name	Contact hour
CHE414	Project 1	5
CHE424	Project 2	6
Total		11

From the previous tables, the reference frames determinations can be summarized as follows:

No.	Department	Contact Hours	The program percentage%	Reference Frames' percentage %
A	Humanities and Social sciences	23	8.71	8-12
B	Business Administration	10	3.79	2-4
C	Mathematics and Basic Sciences	52	19.7	18-22
D	Engineering Culture	14	5.30	4-6
E	Basic Engineering Sciences	77	29.17	25-30
F	Applied Engineering and Design	77	29.17	25-30
G	Projects and Practice	11	4.17	4-6
Total		264	250-280	

10. Contact Hours According to the Requirements

A. University Requirements

Code	Course Name	Contact hour
BAS016	Int. to Computer Systems	4
BAS025	Int. to Engineering and Environment	2
BAS026	Technical English Language 1	4
BAS027	Human Rights	2
BAS114	Technical English Language 2	4
BAS214	Heritage of Egyptian Literature	2
BAS421	Research and Analytic Skills	2
Total		**20**

B. Institute Requirements

Code	Course Name	Contact hour
BAS011	Mathematics 1	4
BAS012	Mechanics 1	4
BAS013	Physics 1	6
BAS014	Engineering Chemistry	4
BAS015	Engineering Drawing and Projection	5
BAS021	Mathematics 2	4
BAS022	Mechanics 2	4
BAS023	Physics 2	6
BAS024	Production Engineering	5
BAS111	Mathematics 3	4
BAS112	Electrical Engineering Fundamentals	5
BAS113	Engineering Thermodynamics	5
BAS121	Mathematics 4	4
BAS122	Technical Report Writing	4
BAS123	Int.to Information Technology	4

BAS211	Engineering Probability and Statistics	4
BAS221	Numerical Methods in Engineering	4
Total		**76**

C. General Department Requirements

Code	Course Name	Contact hour
BAS115	Computer programming	4
BAS124	Strength of materials	4
BAS212	Fluid Mechanics	4
BAS213	Engineering economy	3
BAS311	Environmental management	3
BAS321	Project management and control	4
CHE111	Inorganic Chemistry	4
CHE121	Organic Chemistry	4
CHE122	Physical Chemistry	4
CHE211	Chemical Engineering Principles1	4
CHE212	Material Science and Metallurgy	4
CHE213	Principles of Engineering Design	4
CHE221	Chemical Engineering Principles 2	5
CHE222	Chemical Engineering Thermodynamics	5
CHE223	Analytical Chemistry	4
CHE224	Process Dynamics and Control	4
CHE225	Heat transfer	5
CHE312	Operations Research	4
CHE314	Biochemistry	4
CHE315	Electrochemistry	4
CHE324	Process Modeling and Simulation	5
CHE411	Computer Applications in Chem. Eng.	5
CHE423	Quality Assurance And Engineering Reliability	3
Total		**94**

D. Specific Department Requirement

Code	Course Name	Contact hour
CHE311	Reactor Design	4
CHE313	Mass Transfer Operations I	4
CHE316	Elective 1	4
CHE321	Mass Transfer Operations II	5
CHE322	Corrosion engineering	4
CHE323	Mechanical unit operations	5
CHE324	Process Modeling and Simulation	5
CHE325	Elective 2	4
CHE412	Petrochemical Engineering	4
CHE413	Plant Design	5
CHE414	Project 1	5
CHE415	Elective 3	4
CHE416	Elective 4	4
CHE421	Industrial Technology in Chem. Eng.	4
CHE422	Petroleum Refining Engineering	4
CHE424	Project 2	6
CHE425	Elective 5	4
CHE426	Elective 6	4
Total		**79**

From the previous tables, the contact hours can be summarized as follow:

No.	Department	Contact Hours	The program percentage%	Reference Frames' percentage %
1	University Requirements	20	7.43	6-10
2	Institute Requirements	76	28.25	22-30
3	General Department Requirements	94	34.94	30-35

4	Specific Department Requirements	79	29.37	20-30
Total		**269**	**(250-280)**	

11. Curriculum Structure distribution

Level 0, Semester 1

Code	Course Name	Hours per week						Degrees			
		Lecture	Lab.	Exercise	Contact	Student's	Total	Periodic Exam	Practical\	Final	Total
BAS011	Mathematics 1	2	-	2	4	4	8	60	-	90	150
BAS012	Mechanics 1	2	-	2	4	4	8	40	-	60	100
BAS013	Physics 1	2	2	2	6	4	10	60	15	75	150
BAS014	Engineering Chemistry	2	2	-	4	4	8	40	10	75	125
BAS015	Engineering Drawing and Projection	1	4	-	5	4	9	50	-	75	125
BAS016	Int.to Computer Systems	2	2	-	4	4	8	40	10	50	100
Total		**11**	**10**	**6**	**27**	**24**	**51**				**750**

Level 0, Semester 2

		Hours per week	Degrees

Code	Course Name	Lecture	Lab.	Exercise	Contact	Student's	Total	Periodic Exam	Practical\	Final	Total
BAS021	Mathematics 2	2	-	2	4	4	8	60	-	90	150
BAS022	Mechanics 2	2	-	2	4	4	8	40	-	60	100
BAS023	Physics 2	2	2	2	6	4	10	60	15	75	125
BAS024	Production Engineering	3	2	-	5	4	9	40	10	75	125
BAS025	Int. to Engineering and Environment	2	-	-	2	2	4	25	-	50	75
BAS026	Technical English Language 1	2	2	-	4	3	7	40	10	50	100
BAS027	Human Rights	2	-	-	2	2	4	20	-	30	50
Total		**15**	**6**	**6**	**27**	**23**	**50**				**750**

Level 1, Semester 1

		Hours per week						Degrees			
Code	Course Name	Lecture	Lab.	Exercise	Contact	Student's	Total	Periodic Exam	Practical\ Oral	Final Exam	Total
BAS111	Mathematics 3	2	-	2	4	4	8	60	-	90	150
BAS112	Electrical Engineering	3	-	2	5	4	9	60	-	90	150

	Fundamentals										
BAS113	Engineering Thermodynamics	3	-	2	5	4	9	40	10	75	125
BAS114	Technical English Language 2	2	2	-	4	3	7	40	10	50	100
BAS115	Computer programming	2	2	-	4	4	8	40	10	50	100
CHE111	Inorganic Chemistry	2	2	-	4	5	9	40	10	75	125
Total		**14**	**6**	**6**	**26**	**24**	**50**				**750**

Level 1, Semester 2

		Hours per week						**Degrees**			
Code	**Course Name**	**Lecture**	**Lab.**	**Exercise**	**Contact**	**Student's load**	**Total**	**Periodic Exam**	**Practical\Oral**	**Final Exam**	**Total**
BAS121	Mathematics 4	2	-	2	4	5	9	60	-	90	150
BAS122	Technical Report Writing	2	2	-	4	4	8	40	10	50	100
BAS123	Int.to Information Technology	2	-	2	4	4	8	40	10	50	100
BAS124	Strength of Materials	2	-	2	4	4	8	40	-	60	100

CHE121	Organic Chemistry	2	2	-	4	5	9	60	15	75	150
CHE122	Physical Chemistry	2	2	-	4	3	7	60	15	75	150
Total		**12**	**6**	**6**	**24**	**25**	**49**				**750**

Level 2, Semester 1

Code	Course Name	Hours per week						Degrees			
		Lecture	Lab.	Exercise	Contact	Student's	Total	Periodic Exam	Practical\	Final	Total
BAS211	Engineering Probability and Statistics	2	-	2	4	4	8	40	-	60	100
BAS212	Fluid Mechanics	2	1	1	4	4	8	60	15	75	150
BAS213	Engineering Economy	2	-	1	3	3	6	40	-	60	100
BAS214	Heritage of Egyptian Literature	2	-	-	2	3	5	20	-	30	50
CHE211	Chemical Eng. Principles 1	2	-	2	4	5	9	60	-	90	150
CHE212	Material science and metallurgy	2	-	2	4	3	7	40	-	60	100
CHE213	Principles of Eng. Design	2	-	2	4	3	7	40	-	60	100
Total		**14**	**1**	**10**	**25**	**25**	**50**				**750**

Level 2, Semester 2

Code	Course Name	Hours per week						Degrees			
		Lecture	Lab.	Exercise	Contact	Student's	Total	Periodic E	Practical\	Final Exam	Total
BAS221	Numerical Methods in Engineering	2	-	2	4	4	8	40	-	60	100
CHE221	Chemical Eng. Principles2	3	-	2	5	5	10	60	-	90	150
CHE222	Chemical Engineering Thermodynamics	2	1	2	5	4	9	40	10	75	125
CHE223	Analytical Chemistry	2	2	-	4	4	9	30	10	60	100
CHE224	Process Dynamics and Control	2	-	2	4	4	8	40	-	60	100
CHE225	Heat transfer	2	1	2	5	3	7	40	10	75	125
CHE226	Training 1*	-	-	-	-	-	-	30	-	20	50
Total		**15**	**4**	**8**	**27**	**24**	**51**				**750**

* The student should make training in the summer following the 2nd semester for 4 weeks.

Level 3, Semester 1

Code	Course Name	Hours per week						Degrees			
		Lecture	Lab.	Exercise	Contact	Student's	Total	Periodic Exam	Practical\ Oral	Final Exam	Total
BAS311	Environmental management	2	-	1	3	3	6	40	-	60	100
CHE311	Reactor Design	2	-	2	4	4	8	50	-	75	125
CHE312	Operations Research	2	-	2	4	4	8	40	-	60	100
CHE313	Mass Transfer Operations I	2	-	2	4	4	8	50	-	75	125
CHE314	Bio chemistry	2	-	2	4	4	8	40	-	60	100
CHE315	Electrochemistry	2	1	1	4	3	7	40	10	50	100
CHE316	Elective 1	2	-	2	4	3	7	50	-	50	100
Total		**14**	**1**	**12**	**28**	**24**	**52**				**750**

Level 3, Semester 2

Code	Course Name	Hours per week						Degrees			
		Lecture	Lab.	Exercise	Contact	Student's	Total	Periodic Exam	Practical\O	Final Exam	Total

BAS321	Project Management and Control	2	-	2	4	4	8	40	-	60	100
CHE321	Mass Transfer Operations II	3	-	2	5	4	9	60	-	90	150
CHE322	Corrosion engineering	2	-	2	4	3	7	40	-	60	100
CHE323	Mechanical unit operations	3	-	2	5	4	9	60	-	90	150
CHE324	Process Modeling and Simulation	3	2	-	5	4	9	40	10	50	100
CHE325	Elective 2	2	-	2	4	4	8	50	-	50	100
CHE326	Training 2*	-	-	-	-	-	-	30	-	20	50
Total		**15**	**2**	**10**	**27**	**23**	**50**				**750**

* The student should make training in the summer following the 2nd semester for 4 weeks.

Level 4, Semester 1

Code	Course Name	Hours per week						**Degrees**			
		Lecture	Lab.	Exercise	Contact	Student's	Total	Periodic Exam	Practical\ Oral	Final Exam	Total
CHE411	Computer Applications in Chem. Eng.	3	2	-	5	4	9	40	10	50	100

CHE412	Petrochemical Engineering	2	-	2	4	4	8	60	15	75	150
CHE413	Plant Design	3	-	2	5	4	9	60	-	90	150
CHE414	Project 1*	3	2	-	5	4	9	75	-	75	150
CHE415	Elective 3	2	-	2	4	4	8	50	-	50	100
CHE416	Elective 4	2	-	2	4	4	8	50	-	50	100
Total		**15**	**4**	**8**	**27**	**24**	**51**				**750**

Level 4, Semester 2

Code	**Course Name**	**Hours per week**						**Degrees**			
		Lecture	**Lab.**	**Exercise**	**Contact**	**Student's load**	**Total**	**Periodic Exam**	**Practical\Oral**	**Final Exam**	**Total**
BAS421	Research and Analytical Skills	2	-	-	2	3	5	20	-	30	50
CHE421	Industrial Technology in Chem. Eng.	2	-	2	4	4	8	50	15	60	125
CHE422	Petroleum Refining Engineering	2	-	2	4	3	7	50	-	75	125

CHE423	Quality Assurance and Engineering Reliability	2	-	1	3	3	6	50	-	50	100
CHE424	Project 2*	2	4	-	6	4	10	50	25	75	150
CHE425	Elective 5	2	-	2	4	3	7	50	-	50	100
CHE426	Elective 6	2	-	2	4	3	7	50	-	50	100
Total		**14**	**4**	**9**	**27**	**23**	**50**				**750**

Continuous course; one oral examination for both CHE414 and CHE424 at the end of the second term.

12. Curriculum Structure and Contents

A. Compulsory								
Level	**Semester**	**Code**	**Course Name**	**Hours per week**			**Competencies**	**Program LO'S**
				Lec.	**Lab.**	**Exer.**		
LEVEL 0	**SEMESTER 1**	BAS 011	Mathematics 1	2	-	2	A1	a3,b3, c3
		BAS 012	Mechanics 1	2	-	2	A1	a1, b1, a2
		BAS 013	Physics 1	2	2	2	A1	a1, b1, a2
		BAS 014	Engineering Chemistry	2	2	-	A1	a1, c2, c3
							A10	d2
		BAS 015	Engineering drawing and projection	1	4	-	A1	a1, b1, a2, b2

A. Compulsory								
Level	Semester	Code	Course Name	Hours per week			Competencies	Program LO'S
				Lec.	Lab.	Exer.		
		BAS 016	Int. to computer systems	2	2	-	A4	a3, c3
							A8	d1,d2
		Total		**11**	**8**	**8**		
	SEMESTER 2	BAS 021	Mathematics 2	2	-	2	A1	c2,b3
							A5	b1, d1
		BAS 022	Mechanics 2	2	-	2	A1	a1, b1, a2, ,c1
		BAS 023	Physics 2	2	2	2	A1	a1, b2, a2, a3
		BAS 024	Production engineering	3	2	-	A1	a1,a3
							A2	a1,b2
							A4	a3
		BAS 025	Int. to Engineering and environment	2	-	-	A3	a2, a3, b1, c1
							A4	a1
							A10	d1,d2
							B2	d1
		BAS 026	Technical English Language 1	2	2	-	A8	d1
		BAS 027	Human Rights	2	-	-	A8	d1
		Total		**15**	**6**	**6**		
LEVEL 1	SEMESTER 1	BAS 111	Mathematics 3	2	-	2	A1	a1, c2, b1
							A10	d1,d2

A. Compulsory								
Level	Semester	Code	Course Name	Hours per week			Competencies	Program LO'S
				Lec.	Lab.	Exer.		
		BAS 112	Electrical Engineering Fundamental	3	-	2	A1	b3,c1,c2
							A2	b1,b4
		BAS 113	Engineering Thermodynamics	3	-	2	A1	a1,a2, b1, c2
		BAS 114	Technical English Language 2	2	2	-	A8	d1,d2
							A10	d1,d2
		BAS 115	Computer programming	2	2	-	A1	a1,c2,c3
							A8	d1,d2
		CHE 111	Inorganic Chemistry	2	2	-	A2	a2, b2, c2
							A7	d2
		Total		**14**	**6**	**6**		
	SEMESTER 2	BAS 121	Mathematics 4	2	-	2	A1	a1,b1
							A3	a2,c2
		BAS 122	Technical Report Writing	2	2	-	A5	a1,b1, ,c1,d1
							A8	d1
		BAS 123	Int. to Information Technology	2	-	2	A3	b1, c1, c2
							A4	a1, b1
		BAS 124	Strength of materials	2	-	2	A1	a1, b1, c2, c3

A. Compulsory								
Level	Semester	Code	Course Name	Hours per week			Competencies	Program LO'S
				Lec.	Lab.	Exer.		
		CHE 121	Organic Chemistry	2	2	-	A2	a1,b1
							A6	b1
							A7	d1,d2,d3
							B1	a1, b1, c1
		CHE 122	Physical Chemistry	2	2	-	A5	a1,c1,d1
							A6	b1
							A7	d1,d2,d3
							B1	a1,b1
		Total		**12**	**6**	**6**		
dLEVEL 2	SEMESTER 1	BAS 211	Engineering Probability and Statistics	2	-	2	A1	a1, c2
							A2	b1,b3
		BAS 212	Fluid Mechanics	2	1	1	A1	a1, a2, b1, b2, b3
							A2	a1, a2, b1
		BAS 213	Engineering Economy	2	-	1	A1	a3,b1
							A3	b1,c1
		BAS 214	Heritage of Egyptian Literature	2	-	-	A9	d3
		CHE 211	Chemical Eng. principles 1	2	-	2	A1	a1,b2,b3, c3

A. Compulsory								
Level	Semester	Code	Course Name	Hours per week			Competencies	Program LO'S
				Lec.	Lab.	Exer.		
		CHE 212	Material science and metallurgy	2	-	2	A10	d1,d2
							B2	d1
							A2	b3
		CHE 213	Principles of Eng. Design	2	-	2	A5	b1
							A9	d1,d2
							A10	d2
							B2	d1
		Total		**14**	**1**	**10**		
	SEMESTER 2	BAS 221	Numerical Methods in Engineering	2	-	2	A2	b2,c1
							A5	b1,d1
		CHE 221	Chemical Eng. Principles2	3	-	2	A1	a1, b2,b3,c2
		CHE 222	Chemical Engineering Thermodynamics	2	1	2	A1	c3, b3
							B1	a1, b1
		CHE 223	Analytical Chemistry	2	2	-	A10	d1
							A1	B2, c2
							B3	d1
							A2	b3,c3
							B2	d1
		CHE 224		2	-	2	A2	c1

A. Compulsory								
Level	Semester	Code	Course Name	Hours per week			Competencies	Program LO'S
				Lec.	Lab.	Exer.		
			Process Dynamics and Control				A6	b1
							B3	d1
		CHE 225	Heat transfer	2	1	2	A1	b2
							A2	b3,c2
							A10	d1
							B1	a1
		CHE 226	Training 1 *	-	-	-	A5	a1,b1
							A7	d1, d2, d3
							A8	d1, d2
							B1	b1, c1
		Total		**15**	**4**	**8**		
		BAS 311	Environmental management	2	-	1	A3	a2, a3, b1, c1
							A4	a1, c1, c3
							A10	d1
LEVEL 3	SEMESTER 1	CHE 311	Reactor Design	2	-	2	A6	a1, b1, c1
							B1	a1, c1
		CHE 312	Operations Research	2	-	2	A2	a1, b3
							A4	a2,c2, b1
							A6	b1, c2
		CHE 313	Mass Transfer Operations I	2	-	2	B1	a1, b1, c1
							A7	d1
		CHE 314	Bio chemistry	2	-	2	A2	a1
							A4	a3

A. Compulsory								
Level	Semester	Code	Course Name	Hours per week			Competencies	Program LO'S
				Lec.	Lab.	Exer.		
							A5	b1,d1
							B1	a1, b1
		CHE 315	Electrochemistry	2	1	1	A10	d1,d2
							B2	d1
							A2	b3,b4
		CHE 316	Elective 1	2	-	2	A3	a1,b1,c2
							A9	d1,d3
							B1	a1,b1,c1
							B2	d1
		Total		**14**	**1**	**12**		
	SEMESTER 2	BAS 321	Project Management and Control	2	-	2	A4	c1, c2
							A6	c2,b1
							A1	a3,b3,c3
		CHE 321	Mass Transfer Operations II	3	-	2	A1	a2,b2,c2
							A7	d1
							B1	a1,b1, c1
							B2	d1
		CHE 322	Corrosion engineering	2	-	2	B2	d1
							B4	d1
		CHE 323	Mechanical unit operations	3	-	2	A3	a1, b1
							A5	c1, d1
							A9	d1,d3
							B1	a1, b1, c1
		CHE 324	Process Modeling and	3	2	-	A2	a2, b3
							B3	d1

A. Compulsory								
Level	Semester	Code	Course Name	Hours per week			Competencies	Program LO'S
				Lec.	Lab.	Exer.		
			Simulation					
		CHE 325	Elective 2	2	-	2	B2	d1
							B4	d1
		CHE 326	Training 2*	-	-	-	A5	c1, d1
							A10	d1, d2
							B2	d1
		Total		**14**	**2**	**10**		
LEVEL 4	SEMESTER 1	CHE 411	Computer Applications in Chem. Eng.	3	2	-	B1	c1
							B3	d1
		CHE 412	Petrochemical Engineering	2	-	2	B2	d1
		CHE 413	Plant Design	3	-	2	A3	a1,b1,c1
							A9	d1
							B1	a1, b1, c1
							B3	d1
							B4	d1
		CHE 414	Project 1*	3	2	-	A2	c1, c2, c3
							A3	c1, c2
							A5	c1, d1
							A6	b1, c1, c2
		CHE 415	Elective 3	2	-	2	B2	d1
							B4	d1
		CHE 416	Elective 4	2	-	2	A4	a1,c1,c3
							B1	b1,c1
		Total		**15**	**2**	**10**		

A. Compulsory								
Level	Semester	Code	Course Name	Hours per week			Competencies	Program LO'S
				Lec.	Lab.	Exer.		
	SEMESTER 2	BAS 421	Research and Analytical skills	2	-	-	A2	b3,c3
		CHE 421	Industrial Technology in Chem. Eng.	2	-	2	A3	a2, a3, b1, c1
							B1	a1, b1, c1
		CHE 422	Petroleum Refining Engineering	2	-	2	A10	d1, d2
							B2	d1
		CHE 423	Quality Assurance and Engineering Reliability	2	-	1	A4	a1, a2, b1, c2, c4
							A6	b1, c2
		CHE 424	Project 2*	2	4	-	A7	d1, d2, d3
							A8	d1, d2
							A9	d1, d2, d3
							B3	d1
							B4	d1
		CHE 425	Elective 5	2	-	2	A3	a2,c1
							A10	d1,d2
		CHE 426	Elective 6	2	-	2	A3	a2, c1
							A10	d1,d2
							B2	d1
							B4	d1
		Total		**14**	**4**	**9**		

13. Elective Courses

The students should choose one course from each of the following tables:

	Code	Course name
Elective 1	CHE316A	Liquefied Natural Gas
	CHE316B	Gas Sweetening
	CHE316C	Gas engineering
	CHE316D	Introduction to combustion phenomena
	CHE316E	Air Pollution
	CHE316F	Engineering Materials Selection
Elective 2	CHE325A	Foams industry
	CHE325B	Ceramics industry
	CHE325C	Polymer engineering
	CHE325D	Food processing technology
Elective 3	CHE415A	Electroplating
	CHE415B	Synthetic fibers

	CHE415C	Paints technology
	CHE415D	Renewable Energy Sources
Elective 4	CHE416A	Water desalination
	CHE416B	Wastewater Treatment
	CHE416C	Rubber industry
Elective 5	CHE425A	Industrial safety
	CHE425B	Special topics in chemical engineering
	CHE425C	Plasticizers
	CHE425D	Fertilizers technology
Elective 6	CHE426A	Pulp and Paper industry
	CHE426B	Polymer processing
	CHE426C	Refractories
	CHE426D	Printing technology

14. Methods and rules for student evaluation

Method (tool)	LO's
1- Written exam	To assess knowledge and understanding intellectual skills: A,B
2- Quizzes and reports	To assess knowledge and understanding & general and transferable skills: a, d
3- Oral exams	To assess knowledge and understanding, intellectual, general and transferable skill: a, b, d
4- Practical	To assess knowledge and understanding, professional, general and transferable skill: a, c, d
5- Project applied on a practical field problem	To assess knowledge and understanding skills, intellectual skills, professional skills, general and transferable skill: a, b, C, D

15. Program Evaluation

Evaluator	Tools	Sample evidence
1-Senior students	▪ Questionnaires	15% of the students
2- Alumni	▪ Questionnaires	
3- Stakeholders	▪ Questionnaires	Samples representative from all sectors
4-External evaluator	▪ Review reports	

16.Matrix between Teaching and Learning Methods and Learning Outcomes

Teaching and learning methods	a Knowledge and understanding	b Mental skills	c Practical and professional skills	d General skills
Face- to- Face lecture	■	■		■

Site visits	■		■	
Self-learning	■	■		■
Writing the article/report	■	■	■	■
Discussion		■	■	■
Problem solving	■	■	■	■
Case Study	■	■		■
Individual projects		■	■	
lab	■	■	■	
Brain storming		■		
Group projects		■	■	■
cooperative research	■	■	■	■
Online lecture	■			■
Flipped classroom	■	■	■	■

17. Chemical Engineering Courses

Level: 0 Semester: 1

BAS011	**Mathematics 1**	**Contact4 Hours**
Content	Algebra: vectors algebra - partial fractions - equations theory - vectors -mathematical deduction - numerical solutions methods (simple repetitive method - Newton and modified Newton's method - intersection method – False position method - arrays -	

	linear equations systems - Gauss Jordan method for deletion. Derivation : function (definition - theories) - basic trigonometric functions and its inverse - exponential and logarithmic functions - hyperbolic functions and its inverse - connection (definition - theories) - limits (definition - theories)- derivatives (definition - theories - higher order types) - curves drawing -mathematical and engineering derivative applications - undefined formulas - Taylor expansion - MacLean expansion - approximation - introduction in partial derivation.				
Lecture	2 hours/week	**Laboratory**	-	**Tutorial**	2hours /week

BAS012	**Mechanics 1**				**Contact4 Hours**
Content	Applications of space vectors – results of group of Forces - momentums - equivalent couples – equivalent groups - equations of equilibrium for rigid bodies - Supports and pivots types - equilibrium under the effect of forces and the space couples - center of mass (groups of particles - flat surfaces) – moment of inertia (mean axes- equal surfaces).				
Lecture	2 hours / week	**Laboratory**	-	**Tutorial**	2hours / week.
BAS013	**Physics 1**				**Contact6 Hours**
Content	Material properties – Physical quantities – Standard units and dimensions –frequency motion, mechanical properties for materials –fluid properties – viscosity – surface tension–sound waves – waves in elastic media - Heat and thermodynamics: heat transfer – Gas motion theory – First law of thermodynamics – entropy and second law of thermodynamics – temperature measurements and thermometers.				

Lecture	2 hours /week	**Laboratory**	2 hours / week	**Tutorial**	2hours /week

BAS014	**Engineering Chemistry**				**Contact4 Hours**
Content	Gaseous status - substantial and heat balance in fuel burning operations and chemical operations - properties of solutions - dynamic balance in physical and chemical operations - kinetic chemical interactions - electric chemistry -introduction to chemical corrosion - water processing - building materials - pollution and its treatment Selected chemical industries: chemical manures - dyes - polymers - sugar -petrochemicals semiconductors - oil, greases and industrial detergents.				
Lecture	2 hours / week	**Laboratory**	2 hours / week	**Tutorial**	- Hours / week.

BAS015	**Engineering drawing and projection**	**Contact5 Hours**
Content	Techniques and skills of engineering drawing – engineering operations – orthogonal projection – secondary orthogonal – solid bodies – intersections (cutters for solid bodies – intersections of surfaces) - personals – projections of simple bodies – rules of writing dimensions – drawing of perspectives – deduction of missing projections – drawing of engineering sections. Drawing of the steel frames - binding and fixing devices - the assembled drawing for some mechanical steel components Introduction to AutoCAD Fundamentals of engineering drafting by way of computer aided drawing (CAD) software. Basic features and capabilities of CAD software and drafting fundamentals including orthographic projection, and	

	isometric pictorials, part dimensioning in 2 dimensional drawings.				
Lecture	1 hours / week	**Laboratory**	4 hours / week	**Tutorial**	-

BAS016	**Introductions to Computer Systems**			**Contact4 Hours**	
Content	Computer architecture – computer systems – files systems – computer networks – internet networks – Database systems and information technology – Computer graphics – multimedia systems – methods of solving problems – logical design for the programs and matrices – applications in programming using one structured or visual languages – using this language in solving the engineering problems.				
Lecture	2 hours / week	**Laboratory**	2 hours / week	**Tutorial**	-

Level 0, Semester 2

BAS021	**Mathematics 2**	**Contact4 Hours**

Content	**Analytical geometry:** equations of second degree and double equation for two straight lines – movement and rotation of axes – groups of unified axes circles – conical sectors (properties of conical sectors - parabola – ellipse – hyperbola) – analytical geometry in space – Cartesian coordinates – cylindrical – spherical – plane in space – equations of surfaces in second order – rotation and movement of axes in space **Integration:** indefinite integration (basic functions – theories) – method of integration (direct – indirect) - definite integration (definition – properties -theories) – applications of definite integration (plain areas – circular volumes – plain technical length) – areas – circular surfaces – numerical integration.				
Lecture	2 hours / week	**Laboratory**	-	**Tutorial**	2hours /week.

BAS022	**Mechanics 2**				**4Contact Hours**
Content	Position, displacement, velocity, and acceleration of particle – plane motion path of particle – description of plane motion using Cartesian axes – projectiles - tied motion for particle in straight path – motion in fixed axes -motion in polar axes – relative motion between particles - tied motion for particle in circular path – principle of work and energy of motion– principle of conservation of mechanical energy – principle of impulse and momentum of rigid body.				
Lecture	**2 hours / week**	**Laboratory**	-	**Tutorial**	**2hours /week.**

BAS023	**Physics 2**	**Contact6 Hours**

Content	Electricity and magnetism: charge and substance- electric field- column's law- electric flux- Gauss law- electric volt- condenser and insulation materials-current, resistance and electric force – ohm's law and simple circuits- magnetic field- Babot and Savart laws – magnetic flux and gauss law- Faraday law - Magnetic impedance Topics: engineering light – light properties for spherical surfaces – lenses and mirrors – wave properties for light and Hygen's principle - interference - polarization- and diffraction - Nuclear physics: nuclear construction – Bohar theorem – principle of quantum theory- laser – optical – electric phenomenon.				
Lecture	2 hours / week	**Laboratory**	2 hours / week	**Tutorial**	2hours / week.

BAS024	**Production Engineering**	**Contact5 Hours**
Content	The engineering substances and its properties - heating and cooling diagrams – heating equilibrium diagrams - alloys - casting operation (sand casting and the preparation of the mold) – forming processes (cold and hot forming: forging - rolling – wire drawing – blanking and piercing - deep drawing - the extrusion) – processes of metal connections (the riveting – welding with its types sticking) – cutting processes (cutting elements – processes – hand machining – automatic cutting machining: lathing - shaping – drilling – milling - grinding – work piece fixation - cutting tools fixation - specifications of the operating machine) – measuring tools (venire caliper – micrometers and its types) – engineering specifications – production cycle – production	

	efficiency - industrial safety – practical training in the different workshops.				
Lecture	3 hours / week	**Laboratory**	2 hours / week	**Tutorial**	-

BAS025	**Introductions to Engineering and Environment**				**6 Contact Hours**
Content	**Engineering concepts**: What is engineering – international classification for the engineering jobs – relation between engineering development and environment economic and social development – engineering branches – ethics of the engineering jobs? **Introduction to environmental science**: the importance of studying environmental science – modern technology and its effect on the environment – quality of the environment and development elements – sources of environmental pollution and method of control (air pollution – water pollution – solid wastes pollution –noise) – economics of environmental pollution control – legislations for the environment protection.				
Lecture	2 hours / week	**Laboratory**	-	**Tutorial**	-

BAS026	**Technical English Language 1**				**6 Contact Hours**
Content	Intensive guided practice in reading and analyzing expository and argumentative prose and in writing and revising essays that demonstrate coherent logical development, an ability to employ effective strategies of argument and persuasion, and a command of written English appropriate for college-level work				
Lecture	2 hours / week	**Laboratory**	-	**Tutorial**	1 hour / week

BAS027	Human rights	2 Contact Hours
Content	الإلمام بأهمية حقوق الإنسان والنشأة التاريخية لتلك الحقوق والمدارس الفقهية لتأصيل تلك الحقوق وأحكام الاتفاقيات الدولية الخاصة بحقوق الإنسان، والمنظمات الدولية العالمية والإقليمية القائمة على حماية تلك الحقوق، وموقف الدستور المصري من حقوق الإنسان، والحماية القانونية لها على الصعيد الوطني والصعيد الدولي، بالإضافة إلى حقوق الإنسان في الشريعة الإسلامية. الأصول التاريخية الفلسفية لحقوق الإنسان المصادر الدولية لحقوق الإنسان العالمية والإقليمية -المصادر الوطنية – لحقوق الإنسان الأجهزة العالمية القائمة على حماية حقوق لإنسان) أجهزة الأمم المتحدة (الحماية - الوطنية. لحقوق الإنسان حقوق الإنسان في الشريعة الإسلامية عرض لبعض طوائف حقوق الإنسان.		

Level 1, Semester 1

BAS111	Mathematics 3	(4 Contact)
Content	**Partial differentiation applications**: maximum and minimum values in more than one variable – directional analysis - the directional differential effects - the multi integrations and its applications (the curved and the orthogonal axis) – Gauss- Stokes theory - the endless series and function expansion – basic concepts for the convergence and divergence. **Ordinary differential equations:** The first order (the equations which can be separated, homogeneous, exact and linear) - the ordinary differential equations from the second order and higher orders (with constant and variable coefficients), systems from the ordinary differential equations– Laplace transfer and its applications in the solution of differential equations.	

Lecture	2 hours / week	Laboratory	-	Tutorial	2hours / week.

BAS112	Electrical Engineering Fundamentals				(5 Contact)
Content	Direct Current - Theory of electric circuits- Delta and Star connections - Sine A.C and D.C circuits - Time vectors diagram- Electric power and power factor in A.C circuits - 3-Phase current - Electric machines - D.C machines – Transformers - Induction and synchronous machines - Fractional power machines.				
Lecture	3 hours / week	Laboratory	-	Tutorial	2hours / week.

BAS113	Engineering Thermodynamics				(4 Contact)
Content	Fundamental concepts - Properties of a pure substance – Equation of state - thermodynamic systems - Work and heat - First law of thermodynamics; Applications to Systems and Control Volumes - Second Law of Thermodynamics; Principle of Carnot cycles; Heat engines, Refrigerators and heat pumps - Principle of the increase of entropy - Applications to systems and control volumes - Irreversibility and availability - Power and refrigeration cycles.				
Lecture	2 hours / week	Laboratory	-	Tutorial	2hours/ week.

BAS026	Technical English Language 2	(3 Contact)
Content	Introduction to academic research and writing through intensive investigation of an issue or topic specified by the instructor. Students will be required to develop and organize a substantial research project related to the topic of the course and to demonstrate the information literacy skills required to find, evaluate, and make appropriate use of primary and secondary materials relevant to their project.	

Lecture	1 hours / week	**Laboratory**	2hours / week.	**Tutorial**	-

BAS115	**Computer Programming**				**(4 Contact)**
Content	Basic concepts of programming: problem analysis and developing the programs charts – structured programming with one programming language - form of the program - repetition - branching - matrix – processes and functions - registers - pointers - connected lists - self repetition - the return. Concepts of object Oriented programming: Classes, inheritance and message passing, fundamentals of Java programming language and its syntax - major class libraries in Java - Java applets - Graphic User Interface programming - practice on Java programming language.				
Lecture	2 hours /week	**Laboratory**	2 hours / week.	**Tutorial**	-

CHE111	**Inorganic Chemistry**				**(4 Contact)**
Content	Comparative study for the following groups of materials with focusing on the compounds which are important to the industry " Haogyns – sulpher group – alcalines – earth alcalynes – familiar items of the fourth and fifth groups in the periodic table – transient metals – selected topics in the inorganic chemistry.				
Lecture	2 hours / week	**Laboratory**	2hours / week.	**Tutorial**	-

Level 1, Semester 2

BAS121	**Mathematics 4**		**(4 Contact)**
Content	Special functions – Fourier series - periodic functions and Euler's laws – Fourier's integrations – solutions of the differential equations by series - solving the partial differential equations using variables separation. Functions		

	with complex variables – complex quantities algebra– multiple values functions - the analytical functions and Koshi's theorem - the complex series – Taylor and Lorant series - the zeros, unique points and the rest - the infinite series.				
Lecture	2 hours / week	**Laboratory**	-	**Tutorial**	2hours /week.

BAS122	**Technical Report Writing**				**(4 Contact)**
Content	Writing the scientific reports by English language: The principles of report preparation - types of reports – formatting the reports – skills of figures and shapes – importing text – chart drawings – optical scanning for the pictures and documents – the border and notes operations in the reports. Saving and indexing the reports – searching for text – coping and safety of information – using the different computer programs packages for writing and demonstrating the reports.				
Lecture	1 hours / week	**Laboratory**	2 hours / week.	**Tutorial**	-

BAS123	**Introduction to Information Technology**	**(4 Contact)**
Content	Introduction to the design and use of computer-based information systems - Software and hardware used in information systems - information requirements - Communication systems – Networking - The internet; the foundations, resources and uses of the internet, emphasizing practical skills for finding, reading and authorizing materials - Fundamentals of computer communication networks – Introduction to computer networking elements; communications architectures and protocols, HTML principles and applications - Case studies.	

Lecture	2 hours / week	**Laboratory**	-	**Tutorial**	2hours / week.

BAS124	**Strength of Materials**				**(4 Contact)**
Content	Simple states of stress and strain - Torsion stresses - Bending and shearing stresses in beams - Compound stresses - Analysis of plane stress - Combined stresses - Analysis of thin-walled pressure vessels - Deflection of beams.				
Lecture	2 hours / week	**Laboratory**	-	**Tutorial**	2 hours / week.

CHE121	**Organic Chemistry**				**(5 Contact)**
Content	Modern presentation of organic chemistry stressing theory and mechanism - extensive use of resonance and conformational analysis; alkanes, cycloalkanes, alkyl halides, alcohols, ethers, alkenes, alkynes, and stereochemistry - Spectroscopy, aromatic compounds, aldehydes and ketones, carboxylic acids and their derivatives, amines, and poly functional compounds. Organic amines – carbohydrates – general study on the aromatic and organic compounds specially Benzene, naftaline and antherasine- study for the hydration, oxidation, halognination, nitration and carbonation and some other operations for the organic compounds. Preparation of the azo and diazo compounds and its importance – alchohols and aldyhides, caitonates and the aromatic acids.				
Lecture	3 hours / week	**Laboratory**	2hours / week	**Tutorial**	-

CHE122	Physical Chemistry				(4 Contact)
Content	Gases; the gas laws- ideal gas equations- kinetic molecular theory- real gases. Solutions; units of concentration- colligative properties- Raoult's law- colloidal matter. Chemical kinetics; rate of reaction- order of reaction- collision theory-reaction mechanism- catalysts. Chemical equilibrium; equilibrium state- factors affecting chemical equilibrium- Chemical reaction equilibrium for homogeneous and heterogeneous reactions. Ionic equilibrium, ionic product of water- pH- pOH ionization of weak acids and bases- salt effect- common ion effect- buffer solution hydrolysis.				
Lecture	2 hours / week	Laboratory	2hours / week.	Tutorial	-

Level 2, Semester 1

BAS211	Engineering Probability and Statistics				(4 Contact)
Content	Probability theory. Discrete and continuous probability distributions. Statistics in engineering. Descriptive Statistics Sampling distributions. Estimation and confidence intervals. Hypothesis testing. Simple regression.				
Lecture	2 hours / week	Laboratory	-	Tutorial	2hours / week.

BAS212	Fluid Mechanics	(4 Contact)
Content	Fluid properties, fluid statics, kinematics, fluid dynamics including energy and momentum equations, dimensional analysis, laminar flow, turbulent flow and its applications, forces	

	on immersed bodies, introduction to compressible flow, applications to filtration and fluidization. **Laboratory course** in Fluid Mechanics includes experiments on venture-meter, friction losses in pipes, center of pressure, flow measuring apparatus, multi-pump test (Pump characteristics) and losses in piping systems.				
Lecture	2 hours / week	**Laboratory**	1 hour/ week.	**Tutorial**	1 hour/week.

BAS213	**Engineering Economy**				**(4 Contact)**
Content	This course covers the basic concepts of engineering economics as applied to the evaluation of capital investment alternatives in both the private and public sectors of our economy. Attention is given to the time value of money by showing the concepts and techniques for evaluating the worth of products, systems, structures, and services in relation to their cost. Economic and cost concepts: calculating economic equivalence, comparison of alternatives and replacement economy. Economic optimization in design and operations. Cost estimation of products and systems.				
Lecture	2 hours / week	**Laboratory**	-	**Tutorial**	2 hours / week.

BAS214	**Heritage of Egyptian Literature**	**(4 Contact)**
Content	يهدف المقرر إلى تعريف الطالب بالتميز الإقليمي لمصر في العصور القديمة والوسطى والحديثة وأثرعبقرية المكان على الفكر والوعى المصري وتجلياته في التراث الأدبي شعرا ونثرا من خلال الدرس التاريخي والنصي للأدب المصري في مراحله المختلفة. محتوى المقرر: مصر وتراثها الأدبي من منظور حضاري وإبداعي - المكتبة التراثية المصرية من منظور تاريخي متجدد - دراسة مفهوم وضعية العصورالوسطى في مصر والفرق بينها وبين العصور الوسطى في أوروبا - التراث الجغرافي المصري وأدب الرحلة في كتابات مصرية - التأليف	

	الموسوعي في مصر والصياغة الأدبية في فن الموسوعات – الظواهر الأدبية الغالبة على الأدب المصري - مناهج دراسة التراث الأدبي المصري ودلالاته - مدارس التأليف والإبداع في تاريخ الفكر المصري - مجالات الإبداع في الشعر المصري)الطبيعة المصرية - أدب الحروب الموضوعات الجديدة والبيئة المصرية(- مدارس الكتابة الفنية على المستوى الرسمي وغيرها - تتبع التطبيق على النص والتحليل من خلال أبرز شعراء وكتاب التراثالمصري من أمثال ابن نباته المصري وابن سناء الملك وصولا إلى أدوار الدكتور محمد كامل حسين والأستاذ أمين الخولى والدكتور جمال حمدان في تناول التراث الأدبي المصري بالتحليل والدراسة المنهجية حول عبقرية المكان.

Lecture	2 hours / week	**Laboratory**	-	**Tutorial**	2 hours / week.

CHE211	**Chemical Engineering Principles I**	**(4 Contact)**
Content	Basic concepts of material and energy balances - Combined material and energy balances - Balances on non-reactive and reactive processes - Application of material and energy balances on unit operations.	

Lecture	2 hours / week	**Laboratory**	-	**Tutorial**	2 hours / week.

CHE212	Material Science and Metallurgy	**(4 Contact)**
Content	Students in this course learn about tools of examination, temperature measurement, metallography, tests for mechanical properties, non-destructive testing, crystalline structure of metals, plastic deformation and working of metals, solidification, solidification theory of liquid metals, equilibrium phase diagrams of binary systems, the iron carbon phase diagram, phase transformations in steel, heat treatment of steel, classification of steels, and the effect of alloying elements, tool steels, cast irons, non-ferrous metals and alloys, metals at high and low temperatures, wear of metals and failure analysis.	

Lecture	2 hours / week	**Laboratory**	-	**Tutorial**	2 hours / week.

CHE213	**Principles of Engineering Design**				**(4 Contact)**
Content	Mechanical components, Motion and power transmission elements, Standard machine elements (threads, fasteners, locking devices, keys, splines, gears, pulleys, bearings, pipe connections, etc.), Welding and riveting conventions, Basics of Machine elements design, Stress analysis, Basic machining processes, Applications of robotics technology.				
Lecture	2 hours / week	**Laboratory**	-	**Tutorial**	2hours/week

Level 2, Semester 2

BAS221	**Numerical Methods in Engineering**				**(4 Contact)**
Content	Numerical solution of linear and nonlinear systems - Numerical differentiation and integration - Curve fitting and interpolation - Numerical solution of initial value problems - Boundary and eigen value problems**.**				
Lecture	2 hours / week	**Laboratory**	-	**Tutorial**	2hours /week.

CHE221	**Chemical Engineering Principles 2**	**(5 Contact)**

Content	Simultaneous material and energy balances of complete process flow sheets– Introduction of computer methods to solve chemical engineering problems– Equation-based approach. Degrees of freedom analysis – Conceptual design of chemical processes – Introduction to basic Chemical Engineering processes (e.g.humidification, binary distillation, extraction) – Computer-aided process design.				
Lecture	3 hours / week	**Laboratory**	-	**Tutorial**	2hours /week.

CHE222	**Chemical Engineering Thermodynamics**				**(4 Contact)**
Content	Thermodynamic properties of homogeneous mixtures - partial molal properties - Fugacity. Ideal and non-ideal solutions - Heat effects of mixing. Excess properties - Phase equilibria; miscible systems; activity coefficient - Gibbs-Duhem Equations - Chemical reactions equilibria.				
Lecture	2 hours / week	**Laboratory**	2hours / week.	**Tutorial**	-

CHE223	**Analytical Chemistry**				**(4 Contact)**
Content	Basic tools in analytical chemistry – Titrimetric methods of analysis (Acid – Base reactions, complex – metric titrations, Redox reactions) - Gravimetric methods of analysis (precipitation gravimetry volatilization gravimetry) – instrumental chemical analysis. Analytical Chemistry Laboratory: Selected experiments for volumetric analysis, Gravimetric analysis and instrumental chemical analysis.				
Lecture	2 hours / week	**Laboratory**	2hours / week.	**Tutorial**	-

CHE224	**Process Dynamics and Control**	**(4 Contact)**

Content	Automatic control merits and basic features – Classification of control action (open-loop and closed-loop, feed-back and feed-forward, process and position control) – Mathematical tools (Linearization, Laplace transforms and block diagram algebra), Process dynamics (first, second and higher orders) – Measuring and actuating elements – Two-position controller – Three-term controller – Controller mechanism and optimum setting – System stability (algebraic and graphical methods). Laboratory experiments demonstrating the principles covered. These include temperature, pressure, flow and concentration measuring devices, and process control simulation for typical chemical plants.				
Lecture	2 hours / week	**Laboratory**	2hours / week.	**Tutorial**	-

CHE225	**Heat Transfer**				**(4 Contact)**
Content	The Heat Transfer course requires that students apply their knowledge of mathematics and science to real thermal engineering systems. In this course an expansion of students engineering skills, developed in thermodynamics and fluid mechanics, is undertaken. Students are required to identify, formulate and solve thermal problems using a combination of mass and energy balances and energy rate equations. The course combines analytical techniques and design principles as applied to thermal systems. The students will have a full understanding of conduction, convection, radiation, condensation and boiling heat transfer and will be able to design a heat exchanger system. Laboratory experiments on conduction, convection, radiation, drop-wise and film condensation, nucleate and film boiling and heat exchangers.				
Lecture	2 hours / week	**Laboratory**	2hours / week.	**Tutorial**	-

CHE226	Training 1	(0 Contact)
Content	Students should spend 4 weeks in field training, after completing the Second level, in any Engineering Institution or Engineering Firms. Students should demonstrate the professional and practical skills they acquired during discussion with their assigned tutors.	
Industrial field	30 hours / week	

Level 3, Semester 1

BAS311	Environmental Management				(3 Contact)
Content	The importance of studying environmental science – modern technology and its effect on the environment – quality of the environment and development elements – sources of environmental pollution and method of control (air pollution – water pollution – solid wastes pollution – noise) – economics of environmental pollution control – legislations for the environment protection.				
Lecture	3 hours / week	Laboratory	-	Tutorial	-

CHE311	Reactor Design	(5 Contact)
Content	Fundamentals of thermodynamics and kinetics of chemical reactions - Analysis of batch, plug-flow and continuous stirred tank reactors for different types of reactions - Non ideal reactor analysis, including residence time distribution, back mixing and dispersion models - Kinetics of isothermal and non-isothermal ideal reactors.	

	Kinetics of heterogeneous or catalytic reactions - Design of different types of catalytic and non-catalytic reactors - Mass and energy transfer limitations in heterogeneous reaction systems - Catalyst effectiveness - Reactor stability and sensitivity to operating parameters - Optimization of reactor design - Factors affecting choice of reactors.				
Lecture	3 hours / week	**Laboratory**	-	**Tutorial**	2hours / week.

CHE312	**Operations Research**				**(4 Contact)**
Content	Models and methods of operations research in solving engineering and management problems. Linear programming, simplex method, duality, sensitivity analysis; transportation, assignment and transshipment models; network flows models; integer programming Probabilistic models in operations research problems. Queuing theory; Markov chains; decision analysis; Markovian decision process, utility functions				
Lecture	2 hours / week	**Laboratory**	-	**Tutorial**	2hours / week.

CHE313	**Mass Transfer Operations I**	**(4 Contact)**
Content	Introduction to mass transfer and diffusion- basic definitions (velocity-concentration- flux)- molecular diffusion in gases- molecular diffusion in liquids molecular diffusion in gels and biological solutions- molecular diffusion in solids convective mass transfer- types of mass transfer coefficients-dimensionless groups in mass transfer- theories of mass transfer- momentum, heat, and mass transfer analogies- equilibrium between two phases- interphase mass transfer- overall mass transfer coefficients. Vapor-liquid equilibria (VLE), binary system distillation (plate and packed columns).- liquid-liquid extraction.	

Lecture	2 hours / week	**Laboratory**	-	**Tutorial**	2hours / week.

CHE314	**Bio Chemistry**				**(4 Contact)**
Content	Principles – Carbohydrates – amino acids – proteins –fatty acids –oils and fats – pharmaceutical compounds				
Lecture	2 hours / week	**Laboratory**	-	**Tutorial**	2 hours / week.

CHE315	**Electrochemistry**				**(4 Contact)**
Content	Chemistry and electricity [Electro neutrality - Potential differences at interfaces]- Electrochemical cells [Transport of charge within the cell-Cell description conventions -Electrodes and electrode reactions] - Standard half-cell potentials [Reference electrodes- Prediction of cell potentials-Cell potentials and the electromotive series - Cell potentials and free energy - The fall of the electron] - The Nernst equation - Concentration cells- Analytical applications of the Nernst equation -Determination of solubility products- Potentiometric titrations - Measurement of pH -Membrane potentials]- Batteries and fuel cells [The fuel cell] - Electrochemical Corrosion [Control of corrosion]- Electrolytic cells [Electrolysis involving water - Faraday's laws of electrolysis-]				
Lecture	2 hours / week	**Laboratory**	-	**Tutorial**	2 hours / week.

CHE316A	**Liquefied Natural Gas**	**(4 Contact)**
Content	Refrigeration systems - Natural gas preparation and liquefaction, thermodynamic aspects of liquefaction, liquefaction plants - Properties of LNG - Vaporization losses and custody transfer.	

Lecture	2 hours / week	**Laboratory**	-	**Tutorial**	2 hours / week.

CHE316B	**Gas Sweetening**				**(4 Contact)**
Content	Basic process principles, amine processes, carbonate processes, physical absorption methods, new amine-type processes, solid bed sweetening, liquid sweetening, sulfur production, and tail gas conditioning.				
Lecture	2 hours / week	**Laboratory**	-	**Tutorial**	2hours / week.

CHE316C	**Gas Engineering**				**(4 Contact)**
Content	Natural gas origins and accumulations- conventional and unconventional natural gas resources- natural gas composition- gas hydrates and their prevention- phase behavior of well fluids- natural gas properties- principal products- product specification and combustion characteristics- exploration, drilling, and well completion- natural gas production- natural gas processing (gas-liquid separation, natural gas dehydration, and natural gas sweetening)- natural gas liquefaction, transportation, and storage.				
Lecture	2 hours / week	**Laboratory**	-	**Tutorial**	2 hours / week.

CHE316D	**Introduction to combustion Phenomena**	**(4 Contact)**
Content	Develops a foundation in combustion phenomena including transport and other mechanisms in homogeneous and heterogeneous combustion. Environmental implications of combustion. Elementary modeling and preliminary design calculations in industrial and modern applications of combustion, such as hazardous waste incineration, gas	

	turbines, catalytic converters, and coal combustion systems. Regulatory concerns, stoichiometry, thermochemistry, incinerators and air pollution control.				
Lecture	2 hours / week	**Laboratory**	-	**Tutorial**	2hours / week.

CHE316E	**Air Pollution**				**(4 Contact)**
Content	Sources, measurements and equipment design for removal of air pollutants - Effects of air pollutants - Dispersion of pollutants in the atmosphere - Particulate matter and its control equipment - Atmospheric photochemical reactions - Instrumentation and emission testing equipment.				
Lecture	2 hours / week	**Laboratory**	-	**Tutorial**	2hours / week.

CHE316F	**Engineering Material Selection**				**(4 Contact)**
Content	Application of engineering of materials science principles in the selection and/or specification of metals, ceramics, and plastic materials for use in structural, mechanical, and chemical usage. Mechanical properties, corrosion, oxidation, and variation of properties with temperature are considered.				
Lecture	2 hours / week	**Laboratory**	-	**Tutorial**	2 hours / week.

Level 3, Semester 2

BAS321	**Project Management and Control**	**(4 Contact)**
Content	Development, negotiation and specification of project contract. Project planning and control using activity network models; network logic; scheduling; resource allocation; time-cost trade off methods; multi-project resource allocation and leveling using available industrial software.	

Lecture	2 hours / week	**Laboratory**	-	**Tutorial**	2hours / week.

CHE321	**Mass Transfer Operations II**				**(4 Contact)**
Content	Molecular mass transport in fluids – Inter-phase mass transport - Continuous two phase mass transport processes. Gas absorption and stripping- adsorption, crystallization- double-effect evaporation, humidification and water cooling-drying - membranes types and applications.				
Lecture	2 hours / week	**Laboratory**	-	**Tutorial**	2hours / week.

CHE322	**Corrosion Engineering**				**(3 Contact)**
Content	Electrolytes and electrolytic transport processes - Electrolytic conductance - Ostwald dilution law - Oxidation States and Oxidation - Reduction Reactions - Balancing Oxidation - Reduction Equations - Voltaic Cells - Cell EMF under standard Conditions - Free Energy and Redox Reactions - Nernst Equation and its applications in spontaneity prediction and Cell EMF under nonstandard conditions - Concentration cells - Batteries and Fuel Cells - Electrolysis and nonspontaneous redox reactions. Electrochemical Aspects of Corrosion: Electrochemical reactions; Polarization; Passivity - Applications of Thermodynamics to Corrosion – Corrosion Prevention: Material selection. Alteration of environment. Inhibitors. Design. Cathodic and anodic protection. Coatings. Corrosion control through water conditioning.				
Lecture	1hours / week	**Laboratory**	-	**Tutorial**	2 hours / week.

CHE323	Mechanical unit operation				(4 Contact)
Content	This course is a study of necessary equations of design to apply them in the design of different chemical processes: absorption and stripping, distillation, solvent extractions, evaporative cooling, solid drying, crystallization, ion exchange, filtration, screening, sedimentation, computation methods in multistage and multicomponent systems and operations including particulate solids.				
Lecture	2 hours / week	Laboratory	-	Tutorial	2 hours / week.

CHE324	Process Modeling and Simulation				(4 Contact)
Content	Review of the basic principles of transport of momentum, heat, and mass with applied problems. Numerical methods for solving more complex problems of transport phenomena and kinetics.				
Lecture	2 hours / week	Laboratory	2 hours / week.	Tutorial	-

CHE325A	Foams Industry				(4 Contact)
Content	Chemical composition and raw materials – low and high-density foams – testing of foams – additives improving properties.				
Lecture	2 hours / week	Laboratory	-	Tutorial	2hours / week.

CHE325B	Ceramics Industry	(4 Contact)
Content	General ceramics fabrication processes – preparation of raw material – cold forming processes – ceramic building material; bricks, tiles, sewer pipes – sanitary ware.	

Lecture	2 hours / week	**Laboratory**	-	**Tutorial**	2hours / week.

CHE325C	**Polymer Engineering**				**(4 Contact)**
Content	Structure and physical properties of polymers, polymer solutions, analysis and testing of polymers, measurement of molecular weight - Types of polymerization reactions; manufacture of polymers; process type of reactors - Polymer processing; plastics, elastomers; properties of commercial polymers; thermoplastics and thermosetting resins.				
Lecture	2 hours / week	**Laboratory**	-	**Tutorial**	2 hours / week.

CHE325D	**Food Processing Technology**				**(4 Contact)**
Content	Basic principles on food processing-processing by application of heat-ambient temperature processing-processing by removal of heat-Heat processing by direct and radiated energy-post-processing operations.				
Lecture	2 hours / week	**Laboratory**	-	**Tutorial**	2hours / week.

CHE326	**Training 2**	**(0 Contact)**
Content	Students should spend 4 weeks in field training, after completing the Third level, in any Engineering Institution or Engineering Firms. They should prepare a technical report implying a full description of the processes they joined for training. Students should demonstrate the professional and practical skills they acquired during discussion of report with their assigned tutors.	
Industrial field	**30 hours / week**	

Level 4, Semester 1

CHE411	**Computer Applications in Chem. Eng.**				**(4 Contact)**
Content	This is the study of contemporary computer tools toward chemical engineering. Students design, develop and deploy computer applications or as applications which can be implemented via the internet. These applications are developed for inventory and production control systems, statistical application, database/data mining applications and for software system integration. Software tools and packages utilized include XML, JavaScript, Java, MATLAB, MSVBA, and MS Access.				
Lecture	2 hours / week	**Laboratory**	2 hours / week.	**Tutorial**	-

CHE412	**Petrochemical Engineering**				**(4 Contact)**
Content	Petroleum chemistry; occurrence, composition of crude oil, distillation, catalytic and thermal cracking, alkylation, hydrogenation, isomerization, polymerization -. Techniques and economics of the production of basic and intermediate petrochemicals as well as some end products**.**				
Lecture	2 hours / week	**Laboratory**	-	**Tutorial**	2 hours / week.

CHE413	**Plant Design**	**(4 Contact)**
Content	The anatomy of a chemical manufacturing process- The Organization of A Chemical Engineering Project- Practical	

	Considerations in Design- The Design Approach- Types of Designs- Scale-up in Design- Safety Factors- Specification Sheets- Construction of a detailed flow sheet using a process simulator (currently HYSIS) - Material and energy balances - Conservation of material and energy flows. Detailed design of equipment: size, construction details, materials of construction, instrumentation and control. General design considerations; plant location- plant layout- plant operation and control- health and safety hazards- fire and explosion hazards- personnel safety- loss prevention- HAZOP study- process economics- optimum design and design strategy- materials transfer, handling and treatment				
Lecture	2 hours / week	**Laboratory**	-	**Tutorial**	2 hours / week.

CHE414	**Project 1**				**(4 Contact)**
Content	Students will be assigned Chemical industrial projects in which they will be expected to apply Principles of Chemical Engineering analysis and design to solve a given real world problem. Reports and presentations will be emphasized in addition to the technical content.				
Lecture	2 hours / week	**Laboratory**	2 hours / week.	**Tutorial**	-

CHE415A	**Electroplating**	**(4 Contact)**
Content	Electrochemistry – Electrochemical cells – Surface preparation – throwing power – Electrochemical baths – Factors affecting electroplating – temperature – bath concentration.	

Lecture	2 hours / week	**Laboratory**	-	**Tutorial**	2hours / week.

CHE415B	**Synthetic Fibers**				**(4 Contact)**
Content	Classification of synthetic fibers – Properties of fibers, Nylon 6 – Nylon 6,6 – Amide fibers – Glass fibers – Teflon.				
Lecture	2 hours / week	**Laboratory**	-	**Tutorial**	2hours / week.

CHE415C	**Paints technology**				**(4 Contact)**
Content	Paints compositions – Classification of paints – primers and final coats – surface preparation – reaction of paint systems. Paints for corrosion resistance.				
Lecture	2 hours / week	**Laboratory**	-	**Tutorial**	2hours / week.

CHE 415D	**Renewable Energy Sources**				**(4 Contact)**
Content	Fossil fuel vs. renewable energy sources- solar energy and its applications- wind power- hydropower- geothermal energy- municipal solid waste and biomass- ocean energy.				
Lecture	2 hours / week	**Laboratory**	-	**Tutorial**	2hours / week.

CHE416A	**Water Desalination**	**(4 Contact)**
Content	The course covers the basic concept of water desalination and combines water chemistry, scaling, corrosion, heat transfer principles, material behavior, and design principles as applied to desalination processes. Attention is given to the thermal (flash, vapor compression) and non-thermal (reverse-osmosis, electro -dialysis) desalination techniques. Water properties and quality criteria and standards as well as	

	corrosion behavior and its control in desalination plants will be discussed.				
Lecture	2 hours / week	**Laboratory**	-	**Tutorial**	2 hours / week.

CHE416B	**Wastewater treatment**				**(4 Contact)**
Content	Water chemistry – water sampling - Water analysis- water treatment processes (Physical processes: screening, mixing, sedimentation, membrane separation - Chemical process: coagulation, chemical precipitation, disinfection, ion exchange) - Biological process (aerobic and anaerobic)				
Lecture	2 hours / week	**Laboratory**	-	**Tutorial**	2hours / week.

CHE416C	**Rubber Industry**				**(4 Contact)**
Content	Natural rubber – isoprene – rubbers – elastomers – chemical vulcanization reaction – ABS.				
Lecture	2 hours / week	**Laboratory**	-	**Tutorial**	2hours / week.

Level 4, Semester 2

BAS421	**Research and Analytic Skills**	**(4 Contact)**
Content	مهارات التحليل: إطار التحليل للمسائل الهندسية مع الأخذ في الاعتبار النواحي الفنية، الاقتصادية البيئية، والأخلاقية. أطوار حل المسائل)فهم المسألة وصياغتها، خطة الحل، تنفيذ الخطة، التقييم، والمراجعة(. دور الإبداع في التحليل .تحليل SWOTأوجه القوة، أوجه الضعف، الفرص، والمخاطر)بالنسبة للبدائل المختلفة .التحليل التفصيلي للتكلفة ـ الفائدة، وكذلك تحليل المخاطر. دور التعاون وعملا لفريق في تحليل المسائل الكبيرة. أهمية العثور على البيانات والمعلومات والمعارف المناسبة.	

	مهاراتالبحث: الطرق الأساسية للبحث في الشبكة المعرفية العالميةWeb) (وكيفية صياغة الاستفساراتالموجهة لمحركات البحث باستخدام الروابط المنطقية)مثل (AND، OR، NOTكيفية البحث باستخدام العبارات، العناوين، المجال، الحاسب المضيف، URL وكذلك الروابط. تقييم نتائج البحث.اختيار محرك البحث المناسب. أهمية تقييم مصداقية الأماكن المتاحة على الشبكة المعرفية العالمية				
Lecture	2 hours / week	**Laboratory**	-	**Tutorial**	2hours / week.

CHE421	**Industrial Technology in Chem. Eng.**				**(4 Contact)**
Content	Introduction in the chemical industries and definitions – Combined processes in the chemical creation – nitratation – sulpherization – halogenations – Oxidation – polymerization – concentration on the organic industrial processes including the combined processes with operation charts until the final products - study of different physical and industrials knitting – natural knitting – cottons – wool etc..				
Lecture	2 hours / week	**Laboratory**	2 hours / week.	**Tutorial**	-

CHE422	**Petroleum Refining Engineering**				**(4 Contact)**
Content	Refinery organization - Refinery feed stocks and products - Crude distillation - Cracking and reforming – Hydro treating - Alkylation. Lubricating oils production - Petroleum gases – Hydro processing; product blending, environmental constraints on refinery products - Term project using actual refinery data to be utilized for typical design calculation on the above operations.				
Lecture	2 hours / week	**Laboratory**	-	**Tutorial**	2hours / week.

CHE423	**Quality Assurance and Engineering Reliability**	**(4 Contact)**

Content	Design of quality control systems; quality methods for establishing product specifications; process control; variables and attributes charts; acceptance sampling; operating characteristics curves; process capabilities; QC software Reliability of parallel and serial engineering systems. Life testing. Impact of reliability on the design process in engineering fields such as mechanical, electrical and structural engineering. Studies the effect of equipment reliability on product quality.					
Lecture	2 hours / week	**Laboratory**	-	**Tutorial**	2hours / week.	

CHE424	**Project 2**				**(4 Contact)**
Content	Continuation and conclusion of the investigations on the chemical industrial problems of Project I; written reports and team presentations are required.				
Lecture	1 hours / week	**Laboratory**	4hours / week.	**Tutorial**	-

CHE425A	**Industrial Safety**				**(4 Contact)**
Content	Introduction, preventing emergencies in the process industry, Human error, Identification and assessment of hazards, Fires and explosions, Hazard of plant modification, case studies, miscellaneous topics to be covered by invited lecturers.				
Lecture	2 hours / week	**Laboratory**	-	**Tutorial**	2hours / week.

CHE425B	**Selected Topics in Chemical Engineering**				**(4 Contact)**
Content	Special topics to be selected by the department to address new subjects in Chemical Engineering.				
Lecture	2 hours / week	**Laboratory**	-	**Tutorial**	2hours / week.

CHE425C	Plasticizers				(4 Contact)
Content	Principles of plasticization- plasticization theories- types of plasticizers- factors opposing plasticization- plasticizer requirements- measurement of plasticizers properties- plasticizer efficiency as a function of plasticizer structure- plasticization of natural polymers- other polymer additives (stabilizers, extenders, lubricants, fillers, and pigments).				
Lecture	2 hours / week	Laboratory	-	Tutorial	2hours / week.

CHE 425D	Fertilizers Technology				(4 Contact)
Content	History of chemical fertilizers- Importance and uses of fertilizers- Potassium fertilizers; production and uses- phosphorus fertilizers; production and uses Sulfur fertilizers- Calcium and Magnesium fertilizers- Nitrogen fertilizers; production and uses- slow release and controlled release fertilizers- Liquid fertilizers- Bio fertilizers- Nano fertilizers.				
Lecture	2 hours / week	Laboratory	-	Tutorial	2hours / week.

CHE426A	Pulp and Paper Industry				(4 Contact)
Content	Raw materials and their chemical structures- mechanical, chemical, and chemi-mechanical pulping-screening and washing of pulp- bleaching of pulp and lignin removal- black liquor and energy recovery– evaporation processes – drying machine- finishing treatment- environmental problems.				
Lecture	2 hours / week	Laboratory	-	Tutorial	2hours / week.

CHE426B	Polymer Processing	(4 Contact)

Content	Theory and practice of polymer processing. Non-Newtonian flow, extrusion, injection molding, fiber, film, and rubber processing. Kinetics of and structural development during solidification. Physical characterization of microstructure and macroscopic properties. Component manufacturing and recycling issues, compounding and blending.				
Lecture	2 hours / week	**Laboratory**	-	**Tutorial**	2 hours / week.

CHE426C	**Refractories**				**(4 Contact)**
Content	Glazes – drying – firing – hot forming and melt forming – stoneware – porcelain, gypsum – enameling abrasives – Cement – Properties of refractories. Equilibrium diagrams.				
Lecture	2 hours / week	**Laboratory**	-	**Tutorial**	2hours / week.

CHE426D	**Printing Technology**				**(4 Contact)**
Content	Chemistry of Printing inks – manufacture of printing inks- printing methods printing on different materials such as textile, paper, plastics - ….. Etc. Factors affecting printing quality- Quality control in printing.				
Lecture	2 hours / week	**Laboratory**	-	**Tutorial**	2hours / week.