Mathematics 1
(BAS011**)**

1- Basic Information:

Program Title	All programs
Department Offering the Program	Basic Science and Engineering Department
Department Responsible for the Course	Basic Science and Engineering Department
Course Title	Mathematics1
Course Code	BAS011
Year/Level	Level: 0
Specialization	Major
Authorization Date of Course Specification	-

Teaching hours	Lectures	Exercise	laboratory	Student's load
	2	2	-	4

2- Course Aims

No.	Aims
1	Master a broad range of Mathematics engineering knowledge and specialized skills of Algebra and Calculus, as well as the ability to apply acquired knowledge of Algebra and Calculus in real-world situations by applying theories and abstract thinking in analytic critical and systemic thinking to identify, diagnose, and solve mathematical engineering problems of varying systems models.

3- Competencies:

Competencies	Learning Outcomes (LO'S)
A1. Identify, formulate, and solve complex engineering problems by applying engineering fundamentals, basic science and mathematics.	**a1** Explain the relevant mathematical engineering principles and theories in the Algebra and Calculus. **b1** Use the mathematical engineering principles and theories that apply in the most fundamental problems . **a3** Explain the basic concepts of derivative and algebra.

4. Course Contents:

No.	Topics	Lecture	Exercise	laboratory	Student load
1	vectors algebra - partial fractions - equations theory	2	2	-	**8**
2	vectors - mathematical induction	2	2	-	**4**
3	Equations theory –Mathematical Deduction	4	4	-	**8**
4	numerical solutions methods (simple repetitive method - Newton and modified Newton's method - intersection method - False position method	4	4	-	**8**
5	Arrays - linear equations systems - Gauss Jordan method for deletion.	4	4	-	**8**
6	function (definition - theories) - basic trigonometric functions and its inverse - exponential and logarithmic functions	4	4	-	**8**
7	hyperbolic functions and its inverse - connection (definition - theories) - limits (definition - theories) - derivatives (definition - theories - higher order types)	4	4	-	**8**
8	- curves drawing - mathematical and engineering derivative applications - undefined formulas - Taylor expansion - MacLean expansion - approximation - introduction in partial derivation.	4	4	-	**4**
Total		**28**	**28**	**-**	**56**

5. Teaching and learning methods:

Topics	Face-to-Face Lecture	Online Lecture	Flipped Classroom	Presentation and movies	Discussion	Problem solving	Brain storming	Projects	Site visits	Self-learning and Research	Cooperative	Discovering	Modeling	lab
vectors algebra - partial fractions - equations theory	x	x			x	x	x							
vectors - mathematical induction	x	x			x	x	x							
Equations theory – Mathematical Deduction	x	x			x	x	x							
numerical solutions methods (simple repetitive method - Newton and modified Newton's method - intersection method - False position method	x	x			x	x	x							
arrays - linear equations systems - Gauss Jordan method for deletion.	x	x			x	x	x							

function (definition - theories) - basic trigonometric functions and its inverse - exponential and logarithmic functions	x	x			x	x	X							
hyperbolic functions and its inverse - connection (definition - theories) - limits (definition - theories) - derivatives (definition - theories - higher order types)	x	x			x	x	X							
- curves drawing - mathematical and engineering derivative applications - undefined formulas - Taylor expansion - MacLean expansion - approximation - introduction in partial derivation.	x	x			x	x	X							

6. Teaching and learning methods for disable students:

No.	Teaching Methods	Reason
1	Presentation of the course in digital material	Better access any time
2	Wed communication with students	Better communication with certain cases
3	Asking small groups to do assignments; each composed of low ,medium and high performance students	Knowledge and skills transfer among different levels of students

7. Student Evaluation:

7.1 Student Evaluation methods:

No.	Evaluation Method	Competencies	LO's

1	Periodic exams	A1	a1,b1
2	Semester work(quizzes, sheets, report)	A1	b1
3	Final term examination	A1	a1,b1,a3

7.2 Evaluation Schedule:

No.	Evaluation Method	Weeks
1	Periodic exams	8th
2	Student load	7th - 9th
3	Final term examination	15th

7.3 weighting of Evaluation:

No.	Evaluation Method	Marks
1	Periodic exams	30
2	Student load	30
3	Final term examination	90
Total		**150**

8. List of References:

No.	Reference List
1	Richard W. Fisher "No-Nonsense Algebra, 2nd Edition" Math Essentials; 2nd edition (2018).
2	William Briggs "Calculus: Early Transcendentals" Pearson; 3rd edition, (2018).

9. Facilities required for teaching and learning:

Facility			
1	Lecture classroom	3	White board
2	Seminar	4	Data Show system

10. Matrix of Competencies and LO’s:

No	Topic	Aims	Competencies	LO’s
1	vectors algebra - partial fractions - equations theory	1	A1	a1,b1
2	vectors - mathematical induction	1	A1	a1, b1
3	Equations theory –Mathematical Deduction	1	A1	a1,b1
4	numerical solutions methods (simple repetitive method - Newton and modified Newton's method - intersection method - False position method	1	A1	a1, b1
5	arrays - linear equations systems - Gauss Jordan method for deletion.	1	A1	a1,b1
6	function (definition - theories) - basic trigonometric functions and its inverse - exponential and logarithmic functions	1	A1	a3, b1
7	hyperbolic functions and its inverse - connection (definition - theories) - limits (definition - theories) - derivatives (definition - theories - higher order types)	1	A1	a3, b1
8	- curves drawing - mathematical and engineering derivative applications - undefined formulas - Taylor expansion - MacLean expansion - approximation - introduction in partial derivation.	1	A1	a1, b1

Course Coordinator: Dr / Reda Abdo
Head of Department: Ass.prof. Amal bahiry
Date of Approval: 2023

Mechanics 1
(BAS012)

1-Basic Information:

Program Title	All programs
Department Offering the Program	Basic Science and Engineering Department
Department Responsible for the Course	Basic Science and Engineering Department
Course Title	Mechanics 1
Course Code	BAS012
Year/Level	Level: 0
Specialization	Major
Authorization Date of Course Specification	-

Teaching hours	Lectures	Exercise	laboratory	Student's load
	2	2	-	4

2- Course Aims:

No.	Aims
1	Master a broad range of statics knowledge to apply it on force system, distributed forces and moment of inertia.
3	Use the techniques, skills, and current engineering tools required for engineering practice of Statics applications by taking full responsibility for one's own learning and development, participating in lifelong learning and consider the impact of statics study in real world, and its strong relation with environment and almost of all the technology fields upgrades.

3- Competencies:

Competencies	Learning Outcomes (LO'S)
A1. Identify, formulate, and solve complex engineering problems by applying engineering fundamentals, basic science and mathematics.	**a1** Define concepts and theories of space vectors, momentums, equivalent couples, and equation of equilibrium for rigid body. **a2** Recognize methodologies of solving equilibrium under the effect of forces. **b1** Solve engineering problems, such as finding the center of mass (group of particles – flat surfaces).

4. Course Contents:

No.	Topics	Lecture	Exercise	laboratory	Student load
1	Introduction to statics. Fundamental concept Basic quantities of unit dimension-System of units Space, Trigonometry and U.S. Customary units, Force. Statics of particle, Statics of Rigid Body, Free body diagrams. Types of forces, Types of system of forces	2	2	-	**5**
2	Statics of particles Forces on a particle, Addition of vectors, Resultant of several concurrent forces.	2	2	-	**5**
3	Resolution of a forces into components Rectangular components of a forces, (unit vectors). Addition of forces by summing X and Y components. Equilibrium of a particle, and Newton's first law of motion.	2	2	-	**5**
4	Problem involving the equilibrium of a practice- free body diagram. Rectangular components of a forces in space, force defined by its magnitude and two points on its line of action. Addition of concurrent forces in space, equilibrium of a particle in space.	2	2	-	**5**
5	Rigid bodies: equivalent systems of forces. External and internal forces, principle of transmissibility and equivalent forces, vector product of two vectors, vector product expressed in terms of rectangular components	2	2	-	**5**
6	Moment of a force about a point. Varignon's theorem, rectangular components of the moment of a force, equivalent systems of forces.	4	4	-	**7**

7	Equilibrium of rigid bodies Free- body diagram. Equilibrium of a rigid body in two dimensions.	2	2	-	**5**
8	Equilibrium of three- dimension force body. Reduction of a system of forces to one force and one couple. Equilibrium of a rigid body in three dimensions. Reactions at supports and connections for a two- dimensional and for a three-dimensional structure.	4	4	-	**7**
9	Centroids and centers of gravity. Centre of gravity of a two- dimensional body, centroids of area and lines, first moments of areas and lines, composite plates and wires.	4	4	-	**6**
10	Analysis of structures Definition of truss Simple trusses Analysis of trusses by the method of joints	4	4	-	**6**
Total		**28**	**28**	**-**	**56**

5. Teaching and learning methods:

Topics	Face-to-Face Lecture	Online Lecture	Flipped Classroom	Presentation and movies	Discussion	Problem solving	Brain storming	Projects	Site visits	Self-learning and Research	Cooperative	Discovering	Modeling	lab
Introduction to statics. Fundamental concept Basic quantities of unit dimension- System of units Space, Trigonometry and U.S.	**x**	**x**			**x**									
Customary units, Force. Statics of particle, Statics of Rigid Body, Free body diagrams. Types of forces, Types of system of forces														
Statics of particles Forces on a particle, Addition of vectors, Resultant of several concurrent forces.	**x**	**x**				**x**								

Resolution of a forces into components Rectangular components of a forces, (unit vectors). Addition of forces by summing X and Y components. Equilibrium of a particle, and Newton's first law of motion.	x	x					x							
Problem involving the equilibrium of a practice-free body diagram. Rectangular components of a forces in space, force defined by its magnitude and two points on its line of action. Addition of concurrent forces in space, equilibrium of a particle in space.	x	x			x									
Rigid bodies: equivalent systems of forces. External and internal forces, principle of transmissibility and equivalent forces, vector product of two vectors, vector product expressed in terms of rectangular components	x	x			x	x								

Moment of a force about a point. Varignon᾽s theorem, rectangular components of the moment of a force, equivalent systems of forces.	x	x			x									
Equilibrium of rigid bodies Free- body diagram. Equilibrium of a rigid body in two dimensions.	x	x			x									
Equilibrium of three-dimension force body. Reduction of a system of forces to one force and one couple. Equilibrium of a rigid body in three dimensions. Reactions at supports and connections for a two-dimensional and for a three- dimensional structure.	x	x				x								
Centroids and centers of gravity. Centre of gravity of a two- dimensional body, centroids of area and lines, first moments of areas and lines, composite plates and wires.	x	x			x	x								

Analysis of structures Definition of truss Simple trusses Analysis of trusses by the method of join	x	x			x									

6. Teaching and learning methods for disable students:

No.	Teaching Methods	Reason
1	Presentation of the course in digital material	Better access any time
2	Wed communication with students	Better communication with certain cases
3	Asking small groups to do assignments; each composed of low ,medium and high performance students	Knowledge and skills transfer among different levels of students

7. Student Evaluation:

7.1 Student Evaluation methods:

No.	Evaluation Method	Competencies	LO's
1	Periodic exams	A1	a1,b1
2	Semester work(quizzes, sheets, report)	A1	a1,b1
3	Final term examination	A1	a1,a2,b1

7.2 Evaluation Schedule:

No.	Evaluation Method	Weeks
1	Periodic exams	8th
2	Student load	2nd -7th - 9th -14th
3	Final term examination	15th

7.3 weighting of Evaluation:

No.	Evaluation Method	Marks
1	Periodic exams	20
2	Student load	20

3	Final term examination	60
Total		**100**

8. List of References:

No.	Reference List
1	M. Abdullah Al Faruque, Bahar Zoghi, Sylvester A. Kalevela " Engineering statics" 1st edition, CRC Press (2019).
2	Bogachev, V., Smolyanov, Oleg G. "Topological Vector Spaces and Their Applications" Springer International Publishing (2017).

9. Facilities required for teaching and learning:

No.	Facility
1	Lecture classroom
2	Seminar
3	White board
4	Data Show system

10. Matrix of Competencies and LO's of the course:

No.	Topic	Aims	Competencies	LO's
1	Introduction to statics. Fundamental concept Basic quantities of unit dimension- System of units Space, Trigonometry and U.S. Customary units, Force. Statics of particle, Statics of Rigid Body, Free body diagrams. Types of forces, Types of system of forces	1	A1	a1
2	Statics of particles Forces on a particle, Addition of vectors, Resultant of several concurrent forces.	1	A1	a1

3	Resolution of a forces into components Rectangular components of forces, (unit vectors). Addition of forces by summing X and Y components. Equilibrium of a particle, and Newton's first law of motion.	3	A1	a2

4	Problem involving the equilibrium of a practice- free body diagram. Rectangular components of a forces in space, force defined by its magnitude and two points on its line of action. Addition of concurrent forces in space, equilibrium of a particle in space.	3	A1	a2
5	Rigid bodies: equivalent systems of forces. External and internal forces, principle of transmissibility and equivalent forces, vector product of two vectors, vector product expressed in terms of rectangular components	1	A1	a1
6	Moment of a force about a point. Varignon's theorem, rectangular components of the moment of a force, equivalent systems of forces.	1	A1	a1
7	Equilibrium of rigid bodies Free-body diagram. Equilibrium of a rigid body in two dimensions.	3	A1	a2

8	Equilibrium of three- dimension force body. Reduction of a system of forces to one force and one couple. Equilibrium of a rigid body in three dimensions. Reactions at supports and connections for a two- dimensional and for a three- dimensional structure.	3	A1	a1,a2
9	Centroids and centers of gravity. Centre of gravity of a two-dimensional body, centroids of area	1	A1	b1
	and lines, first moments of areas and lines, composite plates and wires.			
10	Analysis of structures Definition of truss Simple trusses Analysis of trusses by the method of joints	3	A1	b1

Course Coordinator: Dr / Moataz Mostafa
Head of Department: Ass.prof. Amal bahiry
Date of Approval: 2023

Physics1
(BAS013)

1-Basic Information:

Program Title	All programs
Department Offering the Program	Basic Science and Engineering Department
Department Responsible for the Course	Basic Science and Engineering Department
Course Title	Physics1
Course Code	BAS013
Year/Level	Level 0
Specialization	Major
Authorization Date of Course Specification	-

Teaching hours	Lectures	Exercise	laboratory	Student's load
	2	2	2	4

2- Course Aims:

No.	Aims
1	Mastery of a broad range of engineering physics knowledge and specialized skills, as well as the ability to apply acquired knowledge in real-world situations by applying theories in critical and systemic analytical thinking to identify, diagnose, and solve engineering problems of varying complexity and variance.
4	Use the experimental 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.

3- Competencies:

Competencies	Learning Outcomes (LO'S)
A1. Identify, formulate, and solve complex engineering problems by applying engineering fundamentals, basic science and mathematics.	**a1** Explain concepts and theories of mathematics for physical quantities, unit's dimensional analysis and basics of thermodynamics. **a2** Recognize methodologies of solving problems for stress-strain diagram, and fluids study. **b1** Select the appropriate solutions for properties of materials through Brittle and Ductile material.

4. Course Contents:

No.	Topics	Lecture	Exercise	laboratory	Student load
1	Physics and Measurement Practical: measurement methods	4	4	2	**8**
2	Mechanical properties for materials Practical: Hooks' Law	4	4	2	**8**
3	Oscillations Practical: simple pendulum.	4	4	2	**8**
4	Sounds. Practical: Resonance in the Air columns.	2	2	4	**4**
5	Fluids. Practical: Viscosity.	4	4	4	**8**
6	Heat transfer Practical: Heat& Specific Heat& thermoelectrical equivalent& the latent heat of melting ice.	2	2	6	**4**
7	The kinetic theory of gases and the work in thermodynamics Practical: melting point of solid materials.	2	2	4	**4**
8	The laws of thermodynamic Practical: heating and cooling curves.	4	4	2	**8**
9	Temperature and thermal expansion Practical: coefficient of linear thermal expansion.	2	2	2	**4**
Total		**28**	**28**	**28**	**56**

5. Teaching and learning methods:

No	Topics	Face-to-Face Lecture	Online Lecture	Flipped Classroom	Presentation and movies	Discussion	Problem solving	Brain storming	Projects	Site visits	Self-learning and Research	Cooperative	Discovering	Modeling	lab
1	Physics and Measurement Practical: measurement methods	x	x				x								x
2	Mechanical properties for materials Practical: Hooks' Law	x	x			x									x
3	Oscillations Practical: simple pendulum.	x	x					x							x
4	Sounds. Practical: Resonance in the Air columns.	x	x				x								x
5	Fluids. Practical: Viscosity.	x	x					x							x
6	Heat transfer Practical: Heat& Specific Heat& thermo-electrical equivalent& the latent heat of melting ice.	x	x			x									x
7	The kinetic theory of gases and the work in thermodynamics Practical: melting point of solid materials.	x	x												x

8	The laws of thermodynamic Practical: heating and cooling curves.	x	x				x								x
9	Temperature and thermal expansion Practical: coefficient of linear thermal expansion.	x	x					x							x

6. Teaching and learning methods for disable students:

No.	Teaching Methods	Reason
1	Presentation of the course in digital material	Better access any time
2	Web communication with students	Better communication with certain cases
3	Asking small groups to do assignments; each composed of low, medium and high performance students.	Knowledge and skills transfer among different levels of students

7. Student evaluation:

7.1 Student evaluation method:

No.	Evaluation Method	Competencies	LO's
1	Periodic exams	A1	a1,a2,b1
2	Semester work(quizzes, sheets, report)	A1	a1,a2
3	Practical exam	A1	a2,b1
4	Final term examination	A1	a1,a2

7.2 Evaluation Schedule:

No.	Evaluation Method	Weeks
1	Periodic exams	8th
2	Student load	7th,9th
3	Practical examination	14th
4	Final term examination	15th

7.3 weighting of Evaluation:

No.	Evaluation method	Marks
1	Periodic exams	30
2	final examination	75
3	Practical examination	15
4	Student load	30
Total		**150**

8. List of References:

No.	Reference List
1	Peter J. Williams ; Firas Mansour ; Robert L. Hawkes ; (Nuclear physicist) Javed Iqbal ; Marina Milner-Bolotin. Physics for scientists and engineers : an interactive approach, Nelson Education Ltd., Year: 2019
2	David Halliday, Robert Resnick, Jearl Walker. Fundamentals of Physics, 9th Edition, Binder Ready Version,2019
3	Serway, Raymond A., and John W. Jewett. Physics for scientists and engineers. Cengage learning, 2018.
4	Hibbeler, Russell C. "Mechanics of materials." (2018).

9. Facilities required for teaching and learning:

No.	Facility
1	Lecture classroom
2	Laboratory
3	Presenter
4	White board
5	Data show system

10. Matrix of Competencies and LO's of the course:

No.	Topic	Aims	Competencies	LO's

1	Introduction to statics. Fundamental concept Basic quantities of unit dimension- System of units Space, Trigonometry and U.S. Customary units, Force. Statics of particle, Statics of Rigid Body, Free body diagrams. Types of forces, Types of system of forces	1	A1	a1
2	Statics of particles Forces on a particle, Addition of vectors, Resultant of several concurrent forces.	1	A1	a1
3	Resolution of forces into components Rectangular components of forces, (unit vectors).Addition of forces by summing X and Y components. Equilibrium of a particle, and Newton's first law of motion.	4	A1	a2
4	Problem involving the equilibrium of a practice- free body diagram. Rectangular components of a forces in space, force defined by its magnitude and two points on its line of action. Addition of concurrent forces in space, equilibrium of a particle in space.	4	A1	a2
5	Rigid bodies: equivalent systems of forces. External and internal forces, principle of transmissibility and equivalent forces, vector product of	1	A1	a1
	two vectors, vector product expressed in terms of rectangular components			

6	Moment of a force about a point. Varignon᾽s theorem, rectangular components of the moment of a force, equivalent systems of forces.	1	A1	a1
7	Equilibrium of rigid bodies Free-body diagram. Equilibrium of a rigid body in two dimensions.	4	A1	a2
8	Equilibrium of three- dimension force body.Reduction of a system of forces to one force and one couple. Equilibrium of a rigid body in three dimensions. Reactions at supports and connections for a two- dimensional and for a three- dimensional structure.	4	A1	a1,a2
9	Centroids and centers of gravity. Centre of gravity of a twodimensional body, centroids of area and lines, first moments of areas and lines, composite plates and wires.	1	A1	b1
10	Analysis of structures Definition of truss Simple trusses Analysis of trusses by the method of joints	4	A1	b1

Course Coordinator: Dr. Ahmed Lotfy
Head of Department: Ass.prof. Amal bahiry
Date of Approval: 2023

Engineering chemistry
BAS014

1- Basic Information:

Program Title	All programs
Department Offering the Program	Basic Science and Engineering Department
Department Responsible for the Course	Basic Science and Engineering Department
Course Title	Engineering chemistry
Course Code	BAS014
Year/Level	Level: 0
Specialization	Major
Authorization Date of Course Specification	-

Teaching hours	**Lectures**	**Exercise**	**laboratory**	**Student's load**
	2	-	2	4

2- Course Aims:

No.	**Aims**
1	Master a wide spectrum of engineering knowledge and specialized skills for applying acquired knowledge using theories and abstract thinking in real life situations.
8	Consider the impact of chemical process industries on society, economics, and the environment using fundamental knowledge of chemical process industries.

3- Competencies:

Competencies	**Learning Outcomes (LO'S)**
A1. Identify, formulate, and solve complex engineering problems by applying engineering fundamentals and basic science.	**a1** Describe the relevant Chemical principles and theories in the discipline. **c2** Identify the chemical engineering principles and theories that apply to the topic. **c3** Solve chemical engineering problems by applying chemical engineering fundamentals.

A10. Acquire and apply new knowledge; and practice self, lifelong and other learning strategies.	**d2** Acquire chemical engineering principles for professionally merge , understanding, and feedback to improve design, products for many chemical engineering industries.

4. Course Contents:

No.	Topics	Lecture	Exercise	laboratory	Student load
1	Gaseous status. Practical: Chemistry Laboratory Equipment, Titrimetric Analysis.	4	-	4	**8**
2	Chemical thermodynamics. Practical: Preparation of standard solution of Na_2CO_3 (0.1N), Determination of normality of hclby using standard solution of oxalic acid.	4	-	4	**8**
3	Properties of solutions. Practical: Determination of normality of acetic acid by using standard solution of sodium hydroxide,Determination of normality of sodium carbonate by using standard solution of hcl.	4	-	4	**8**
4	Material balance in combustion processes. Practical: Standardization of potassium permanganate with oxalic acid.	2	-	2	**4**
5	Dynamic balance in physical and chemical operations. Practical: Determination of nitrites, precipitation titrations.	4	-	4	**8**
6	Kinetic chemical interactions. Practical: Preparation of 0.05N of sodium chloride.	2	-	2	**4**
7	Electrochemistry, corrosion and corrosion control. Practical: Determination of chloride ion by using Mohr method.	2	-	2	**4**

8	Fertilizers. Practical: Determining Molecule Weight by Freezing Point Depression Method.	2	-	2	**4**
9	Manufacturing and chemistry of Cement. Practical: Determining Molecule Weight by Freezing Point Depression Method.	2	-	2	**4**
10	Water processes. Practical: determination of water hardness bycomplex metric titration.	2	-	2	**4**
Total		**28**	**-**	**28**	**56**

5. **Teaching and learning methods:**

No	**Topics**	**Face-to-Face Lecture**	**Online Lecture**	**Flipped Classroom**	**Presentation and movies**	**Discussion**	**Problem solving**	**Brain storming**	**Projects**	**Site visits**	**Self-learning and Research**	**Cooperative**	**Discovering**	**Modeling**	**lab**
1	Gaseous status. Practical: Chemistry Laboratory Equipment, Titrimetric Analysis.	**x**	**x**			**X**									**X**
2	Chemical thermodynamics. Practical: Preparation of standard solution of Na_2CO_3 (0.1N), Determination of normality of Hcl by using standard solution of oxalic acid.	**x**	**x**				**X**								**X**

3	Properties of solutions. Practical: Determination of normality of acetic acid by using standard solution of sodium hydroxide, Determination of normality of sodium carbonate by using standard solution of Hcl.	**x**	**x**					**x**							**X**
4	Material balance in combustion processes. Practical: Standardization of potassium permanganate with oxalic	**x**	**x**				**X**								**X**
	acid.														
5	Dynamic balance in physical and chemical operations. Practical: Determination of nitrites, precipitation titrations.	**x**	**x**			**x**									**x**
6	Kinetic chemical interactions. Practical: Preparation of 0.05N of sodium chloride.	**x**	**x**			**x**									**x**
7	Electrochemistry, corrosion and corrosion control. Practical: Determination of chloride ion by using Mohr method.	**x**	**x**				**x**								**x**

8	Fertilizers. Practical: Determining Molecule Weight by Freezing Point Depression Method.	**x**	**x**				**x**								**x**
9	Manufacturing and chemistry of Cement. Practical: Determining Molecule Weight by Freezing Point Depression Method.	**x**	**x**			**x**									**x**
10	Water processes. Practical: determination of water hardness by complex metric titration.	**x**	**x**			**x**									**x**

6. Teaching and learning methods for disable students:

No.	Teaching Methods	Reason
1	Presentation of the course in digital material	Better access any time
2	Web communication with students	Better communication with certain cases
3	Asking small groups to do assignments; each composed of low ,medium and high performance students	Knowledge and skills transfer among different levels of students

7. Student Evaluation:

7.1 Student Evaluation Method:

No.	Evaluation Method	Competencies	LO’s
1	Periodic exams	A1	a1,c3
2	Semester work(quizzes, sheets, report)	A1,A10	c2,c3,d2
3	Practical Examination	A1,A10	c2,c3,d2
4	Final term examination	A1	a1,c2,c3

7.2 Evaluation Schedule:

No.	Evaluation Method	Weeks
1	Periodic exams	From second week to last week

2	Student load	All weeks
3	Practical Examination	14^{th}
4	Final term examination	15^{th}

7.3 weighting of Evaluation:

No.	Evaluation Method	Marks
1	Periodic exams	20
2	Student load	20
3	Practical Examination	10
4	Final term examination	75
Total		**125**

8. List of References:

No.	Reference List
1	Theodore L. Brown, et al, Chemistry the Central Science, Prentice Hall Int. (Pearson International 14 edition), 2017.
2	Peter Atkins , Julio de Paula, James Keeler " Atkins' Physical Chemistry 11ed" Oxford University Press; 11th edition (2018)

9. Facilities required for teaching and learning:

No.	Facility	No.	Facility
1	Lecture classroom	4	Data show system
2	Presenter	5	Sound system
3	White board	6	Laboratory

10. Matrix of Competencies and LO's of the course:

No.	Topic	Aims	Competencies	LO's
1	Gaseous status. Practical: Chemistry Laboratory Equipment, Titrimetric Analysis.	1	A1	a1

2	Chemical thermodynamics. Practical: Preparation of standard solution of Na_2CO_3 (0.1N), Determination of normality of Hcl by using standard solution of oxalic acid.	1	A1	c2, a1
3	Properties of solutions. Practical: Determination of normality of acetic acid by using standard solution of sodium hydroxide, Determination of normality of sodium carbonate by using standard solution of Hcl.	1	A1	a1
4	Material balance in combustion processes. Practical: Standardization of potassium permanganate with oxalic acid.	1	A1	a1,c2, c3
5	Dynamic balance in physical and chemical operations. Practical: Determination of nitrites, precipitation titrations.	1	A1	a1,c3
6	Kinetic chemical interactions. Practical: Preparation of 0.05N of sodium chloride.	1	A1	a1
7	Electrochemistry, corrosion and corrosion control.	1,8	A10	d2
	Practical: Determination of chloride ion by using Mohr method.			
8	Fertilizers. Practical: Determining Molecule Weight by Freezing Point Depression Method.	8	A10	d2
9	Manufacturing and chemistry of Cement. Practical: Determining Molecule Weight by Freezing Point Depression Method.	8	A10	d2

10	Water processes. Practical: determination of water hardness by complex metric titration.	8	A10	d2

Course Coordinator: Asso.prof. Khaled Samir
Head of Department: Asso.prof. Hend Elsayed Gadow
Date of Approval: 2023

Engineering Drawing and Projection

(BAS015)

1-Basic Information:

Program Title	All programs
Department Offering the Program	Basic Science and Engineering Department
Department Responsible for the Course	Basic Science and Engineering Department
Course Title	Engineering Drawing and Projection
Course Code	BAS015
Year/Level	level 0
Specialization	Major
Authorization Date of Course Specification	-

Teaching hours	**Lectures**	**Exercise**	**laboratory**	**Student's load**
	1	-	4	4

2- Course Aims:

No.	Aims
1	Master a broad range of engineering drawing knowledge and specialized skills, as well as the ability to apply acquired knowledge in real-world situations.
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.
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.

3- Competencies :

Competencies	Learning Outcomes (LO'S)

A1. Identify, formulate, and solve complex engineering problems by applying engineering fundamentals, basic science and mathematics.	**a1** Explain the basic principles of engineering drawing. **a2** Explain the scientific principles and theories that apply to the topic. **b1** Using scientific concepts and tools that are relevant to the profession. **b2** Applying engineering drawing basics that are relevant to the subject.

4. Course Contents:

No.	Topics	Lecture	Exercise	laboratory	Student load
1	Techniques and skills of engineering drawing	1	-	4	4
2	Engineering operations	1	-	4	4
3	Orthogonal projection – Secondary orthogonal	2	-	8	8
4	Intersections	1	-	4	4
5	projections of simple bodies	1	-	4	4
6	rules of writing dimensions	1	-	4	4
7	Deduction of missing projections	1	-	4	4
8	Drawing of engineering sections.	1	-	4	4
9	Steel frames	2	-	8	8
10	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.	3	-	12	12
Total		**14**		**56**	**56**

5. Teaching and learning methods:

No	Topics	Face-to-Face Lecture	Online Lecture	Flipped Classroom	Presentation and movies	Discussion	Problem solving	Brain storming	Projects	Site visits	Self-learning and Research	Cooperative	Discovering	Modeling	lab
1	Techniques and skills of engineering drawing	x	x												
2	Engineering operations					x									
3	Orthogonal projection – Secondary orthogonal	x				x									
4	Intersections	x	x			x									
5	Projections of simple bodies	x				x									
6	Rules of writing dimensions	x	x			x									
7	Deduction of missing projections	x	x			x									
8	Drawing of engineering sections.	x				x									
9	Steel frames	x	x			x									

10	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.	x													x

6. Teaching and learning methods for disable students:

No.	Teaching Methods	Reason
1	Presentation of the course in digital material	Better access any time
2	Asking small groups to do assignments each composed of low, medium, and high performance students.	Knowledge and skills transfer among different level of students.

7. Student Evaluation:

7.1 Student Evaluation method:

No.	Evaluation Method	Competencies	LO's
1	Periodic exams	A1	a1,a2,b1
2	Semester work(quizzes, sheets, report)	A1	a1,a2
3	Final exam	A1	b1,b2

7.2 Evaluation Schedule:

No.	Evaluation Method	Weeks
1	Student load	2nd -7th - 9th
2	Periodic exams	8th

3	Practical examination	14th
4	Final term exam	15th

7.3 weighting of Evaluation:

No.	Evaluation Method	Marks
1	Periodic exams	25
2	Student load	25
3	Final-term examination	75
Total		**125**

8. List of References:

No.	Reference List
1	K. V. NATARAJAN "ENGINEERING GRAPHICS Paperback" DHANALAKSHMI PUBLISHERS (2018)
2	Lakhwinder Pal Singh, Harwinder Singh "Engineering Drawing: Principles and Applications" Cambridge University Press; First edition (2019)

9. Facilities required for teaching and learning:

No.	Facility
1	Lecture classroom
2	Computer lab
3	Seminar
4	White board
5	Data Show system

10. Matrix of Competencies and LO's of the course:

No.	Topic	Aims	Competencies	LO's
1	Techniques and skills of engineering drawing	1	A1	a1

2	Engineering operations	1,4	A1	a2
3	Orthogonal projection – Secondary orthogonal	1,4	A1	a1
4	Intersections	1	A1	a1
5	Projections of simple bodies	1	A1	a2
6	Rules of writing dimensions	1,2	A1	b1
7	Deduction of missing projections	1	A1	b1
8	Drawing of engineering sections.	1	A1	b2
9	Steel frames	1	A1	b2
10	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.	1,4	A1	b1,b2

Course Coordinator: Dr / Motaz Mostafa

Head of Department: Ass.prof. Amal bahiry

Date of Approval: 2023

Introductions to Computer Systems

(BAS016**)**

1-Basic Information:

Program Title	All programs
Department Offering the Program	Basic Science and EngineeringDepartment
Department Responsible for the Course	Basic Science and Engineering Department
Course Title	Introductions to Computer Systems
Course Code	BAS016
Year/Level	Level 0
Specialization	Major
Authorization Date of Course Specification	-

Teaching hours	Lectures	Exercise	laboratory	Student's load
	2	-	2	4

2- Course Aims:

No.	Aims
1	Master a wide range of engineering knowledge and specialized skills, as well as the ability to apply that information in real-world situations using theories and analytical thinking.
7	Use techniques, skills and modern engineering tools necessary for engineering practice;

3- Competencies:

Competencies	Learning Outcomes (LO'S)
A1. Identify, formulate, and solve complex engineering problems by applying engineering fundamentals, basic science and mathematics.	c2. Identify the concepts and theories of science necessary for engineering system c3. Applying engineering basics that are relevant to the subject.
A5. Practice research techniques and methods of investigation as an inherent part of learning.	b1. Assess different ideas, views, and knowledge from a range of sources.

4. Course Contents:

No.	Topics	Lecture	Exercise	laboratory	Student load
1	Computer architecture. practical: Visual Studio C# Interface	**2**	**-**	2	**4**
	Writing simple statements				
2	Computer systems Practical: Variables, Data type	**4**	**-**	4	**8**
3	Files systems Practical: Input & Output	**2**	**-**	2	**4**
4	Computer networks Practical: Conditional Statements	**4**	**-**	4	**8**
5	Internet networks Practical:Arrays	**4**	**-**	4	**8**
6	Data systems and information technology Practical: Loop Statement (For, while & do -while)	**4**	**-**	4	**8**
7	Computer graphics – Multimedia systems Practical: Loop Statement (For, while & do -while)	**2**	**-**	2	**4**
8	Methods of solving problems and logical design for the programs and matrices. Practical: Nested loop	**4**	**-**	4	**8**
9	Engineering applications in programming using one structured programming language. Practical: Engineering Case Study.	**2**	**-**	2	**4**
Total		**28**		**28**	**56**

5. Teaching and learning methods:

No	Topics	Face-to-Face Lecture	Online Lecture	Flipped Classroom	Presentation and movies	Discussion	Problem solving	Brain storming	Projects	Site visits	Self-learning and Research	Cooperative	Discovering	Modeling	lab
1	Computer architecture. practical: Visual Studio C# Interface Writing	x	x	x											X
	simple statements														
2	Computer systems Practical: Variables, Data type	x	x			x									x
3	Files systems Practical: Input & Output	x	x			x									x
4	Computer networks Practical: Conditional Statements	x		x											x
5	Internet networks Practical: Arrays	x	x												x
6	Data systems and information technology Practical: Loop Statement (For, while & do -while)	x	x												x
7	Computer graphics – Multimedia systems Practical: Loop Statement (For, while & do -while)	x	x			x									x

8	Methods of solving problems and logical design for the programs and matrices. Practical: Nested loop	x	x				x								x
9	Engineering applications in programming using one structured programming language. Practical: Engineering Case Study.	x	x												x

6. Teaching and learning methods for disable students:

No.	Teaching Methods	Reason
1	Presentation of the course in digital material	Better access any time
2	Web communication with students	Better communication with certain cases
3	Asking small groups to do assignments; each composed of low, medium and high performance students.	Knowledge and skills transfer among different levels of students

7. Student Evaluation:

7.1 Student Evaluation method:

No.	Evaluation Method	Competencies	LO's
1	Periodic exams	A1	c2,c3
2	Semester work(quizzes, sheets, report)	A5	b1
3	Practical Examination	A1	c2,c3
4	Final term examination	A1	c3

7.2 Evaluation Schedule:

No.	Evaluation Method	Weeks
1	Periodic exams	8th
2	Student load	2nd ,7th,9th,13th
3	Practical Examination	14th
4	Final term examination	15th

7.3 weighting of Evaluation:

No.	Evaluation Method	Marks

1	Periodic exams	20
2	final examination	50
3	Practical examination	10
4	Student load	20
Total		**100**

8. List of References:

No.	Reference List
1	Darrell Hajek , Cesar Herrera "Introduction to Computers" CreateSpace Independent Publishing Platform (May 8, 2018).
2	Computing essentials timothy, O' leary and linda, 2021.
3	Ludwik Czaja "Introduction to Distributed Computer systems: Principles and features" Springer; 1st ed. 2018.

9. Facilities required for teaching and learning:

No.	Facility
1	Lecture classroom
2	Computer lab
3	Presenter
4	White board
5	Data show system
6	Wireless internet
7	Sound system

10. Matrix of Competencies and LO's of the course:

No.	Topic	Aims	Competencies	LO's
1	Computer architecture. practical: Visual Studio C# Interface Writing simple statements	1	A1	c2

2	Computer systems Practical: Variables, Data type	1	A1	c2
3	Files systems Practical: Input & Output	1	A1	c3
4	Computer networks Practical: Conditional Statements	1	A1	c3
5	Internet networks Practical: Arrays	1	A1	c3
6	Data systems and information technology Practical: Loop Statement (For, while & do -while)	1,7	A1	c3
7	Computer graphics – Multimedia systems Practical: Loop Statement (For, while & do -while)	1,7	A1	c3
8	Methods of solving problems and logical design for the programs and matrices. Practical: Nested loop	7	A5	b1
9	Engineering applications in programming using one structured programming language. Practical: Engineering Case Study.	7	A5	b1

Course Coordinator: Dr. Amira El Sonbaty

Head of Department: Ass.prof. Amal bahiry

Date of Approval: 2023

Mathematics 2
(BAS021**)**

1- Basic Information:

Program Title	All programs
Department Offering the Program	Basic Science and Engineering Department
Department Responsible for the Course	Basic Science and Engineering Department
Course Title	Mathematics 2
Course Code	BAS021
Year/Level	Level: 0
Specialization	Major
Authorization Date of Course Specification	-

Teaching hours	**Lectures**	**Exercise**	**laboratory**	**Student's load**
	2	2	-	4

2- Course Aims:

No.	**Aims**
1	Master a broad range of fundamental Mathematical engineering knowledge and specialized skills of Analytical geometry and Integration, as well as the ability to apply acquired knowledge of Analytical geometry and Integration in real-world situations as determine the plain areas , circular volumes, plain technical length and circular surfaces by applying theories and abstract thinking in analytic critical and systemic thinking to identify, diagnose, and solve mathematical engineering problems by using different methods.

3- Competencies :

Competencies	**Learning Outcomes (LO'S)**

A1. Identify, formulate, and solve complex engineering problems by applying engineering fundamentals, basic science and mathematics.	a1. Explain the relevant mathematical engineering principles and theories in the Analytical geometry and Integration. b1. Use the mathematical engineering principles and theories that apply in the most fundamental problems . a3. Explain the basic concepts of Analytical geometry and Integration b3. Use the basics of integration and Geometry that are applicable to the field.

4. **Course Contents:**

No.	Topics	Lecture	Exercise	laboratory	Student load
1	equations of second degree and double equation for two straight lines - movement and rotation of axes - groups of unified axes circles	4	4	-	**8**
2	conical sectors (properties of conical sectors - parabola - ellipse - hyperbola)	6	6	-	**12**
3	analytical geometry in space - Cartesian coordinates - cylindrical - spherical	2	2	-	**4**
4	Plane in space - equations of surfaces in second order - rotation and movement of axes in space.	2	2	-	**4**
5	indefinite integration (basic functions - theories) - method of integration (direct - indirect)	6	6	-	**12**
6	- definite integration (definition - properties - theories) -	4	4	-	**8**
7	applications of definite integration (plain areas - circular volumes - plain technical length)	2	2	-	**4**
8	Areas - circular surfaces - numerical integration.	2	2	-	**4**
Total		**28**	**28**	**-**	**56**

5. Teaching and learning methods:

No	Topics	Face-to-Face Lecture	Online Lecture	Flipped Classroom	Presentation and movies	Discussion	Problem solving	Brain storming	Projects	Site visits	Self-learning and Research	Cooperative	Discovering	Modeling	lab
1	equations of second degree and double equation for two straight lines - movement and rotation of axes - groups of unified axes circles	x	x			x									
2	conical sectors (properties of conical sectors - parabola - ellipse - hyperbola)	x	x				x								
3	analytical geometry in space - Cartesian coordinates - cylindrical - spherical	x	x					x							
4	plane in space - equations of surfaces in second order - rotation and movement of axes in space.	x	x			x		x							

5	indefinite integration (basic functions - theories) - method of integration (direct - indirect)	x	x			x	x								
6	- definite integration (definition - properties - theories) -	x	x			x									
7	applications of definite integration (plain areas - circular volumes - plain technical length)	x					X	x							
8	areas - circular surfaces - numerical integration.	x	x			X									

6. Teaching and learning methods for disable students:

No.	Teaching Methods	Reason
1	Presentation of the course in digital material	Better access any time
2	Wed communication with students	Better communication with certain cases
3	Asking small groups to do assignments; each composed of low ,medium and high performance students	Knowledge and skills transfer among different levels of students

7. Student Evaluation:

7.1 Student Evaluation method:

No.	Evaluation Method	Competencies	LO's
1	Periodic exams	A1	a1,a3
2	Semester work(quizzes, sheets, report)	A1	b1,b3
3	Final term examination	A1	a1,a3,b1,b3

7.2 Evaluation Schedule:

No.	Evaluation Method	Weeks
1	Periodic exams	Any week

2	Student load	All weeks
3	Final term examination	15th

7.3 weighting of Evaluation:

No.	Evaluation Method	Marks
1	Periodic exams	30
2	Student load	30
3	Final term examination	90
	Total	**150**

8. List of References:

No.	Reference List
1	P.N.Chatterjee "Analytical Geometry Paperback"Anu Books (2019)
2	Gerardus Blokdyk "System Integration A Complete Guide" 5STARCooks (2019).
3	Chris McMullen " Essential Calculus Skills Practice Workbook with Full Solutions" Zishka Publishing (2018).

9. Facilities required for teaching and learning:

Facility			
1	Lecture classroom	3	White board
2	Seminar	4	Data Show system

10. Matrix of Competencies and LO's of the course:

No	Topic	Aims	Competencies	LO's
1	equations of second degree and double equation for two straight lines - movement and rotation of axes - groups of unified axes circles	1	A1	a1,a3
2	conical sectors (properties of conical sectors - parabola - ellipse - hyperbola)	1	A1	a1,a3
3	analytical geometry in space - Cartesian coordinates - cylindrical – spherical	1	A1	a1,a3

4	Plane in space - equations of surfaces in second order - rotation and movement of axes in space.	1	A1	a1,a3
5	indefinite integration (basic functions - theories) - method of integration (direct - indirect)	1	A1	a1,a3
6	- definite integration (definition - properties - theories) -	1	A1	a1,a3
7	applications of definite integration (plain areas - circular volumes - plain technical length)	1	A1	b1,b3
8	Areas - circular surfaces - numerical integration.	1	A1	b1,b3

Course Coordinator: Dr / Reda Abdo
Head of Department: Ass.prof. Amal bahiry
Date of Approval: 2023

Mechanics 2
(BAS022**)**

1- Basic Information:

Program Title	All programs
Department Offering the Program	Basic Science and Engineering Department
Department Responsible for the Course	Basic Science and Engineering Department
Course Title	Mechanics 2
Course Code	BAS022
Year/Level	Level: 0
Specialization	Major
Authorization Date of Course Specification	-

	Lectures	Exercise	laboratory	Student's load
Teaching hours	2	2	-	4

2- Course Aims:

No.	Aims
1	Master a broad range of Mechanics knowledge and specialized skills, as well as the ability to apply acquired knowledge in real-world situations by applying theories in analytic critical and systemic thinking to identify, diagnose, and solve engineering problems of varying complexity and variation.

3- Competencies :

Competencies	Learning Outcomes (LO'S)
A1. Identify, formulate, and solve complex engineering problems by applying engineering fundamentals, basic science and mathematics.	**a1** Define position, velocity and acceleration of particles and principles of conversation of mechanical energy **a2** Recognize methodologies of solving engineering problems including principles of work and energy **b1** Solve engineering problems to determine the velocity and position of projectile **c1** Apply knowledge of principle of work and principle of work and energy of motion and principle of conservation of mechanical energy and momentum of rigid body.

4. Course Contents:

No.	Topics	Lecture	Exercise	laboratory	Student load
1	Position, Displacement, Velocity, and Acceleration of particle	4	4	-	**8**
2	Plane Motion Path of Particle	2	2	-	**4**
3	Description of plane motion using Cartesian axes	2	2	-	**4**
4	Projectiles	2	2	-	**4**
5	Relative motion between particles	2	2	-	**4**
6	Motion for particle in circular path	2	2	-	**4**
7	Newton's second law of motion	4	4	-	**8**
8	Principle of work and energy of motion	4	4	-	**8**
9	Principle of conservation of mechanical energy	2	2		**4**
10	Principle of Impulse and Momentum of rigid body	4	4		**8**
Total		**28**	**28**	-	**56**

5. Teaching and learning methods:

No	Topics	Face-to-Face Lecture	Online Lecture	Flipped Classroom	Presentation and movies	Discussion	Problem solving	Brain storming	Projects	Site visits	Self-learning and Research	Cooperative	Discovering	Modeling	lab
1	Position, Displacement, Velocity, and Acceleration of Particle	x	x			x									
2	Plane Motion path of Particle	x	x			x									
3	Description of plane Motion using Cartesian axes	x	x	x											
4	Projectiles	x	x					x							
5	Relative motion between particles	x	x			x									
6	Motion for particle in circular path	x	x			x									
7	Newton's second law of motion	x	x				x								
8	Principle of work and energy of motion	x	x	x											
9	Principle of conservation of mechanical energy	x	x			x									
10	Principle of impulse and momentum of rigid body	x	x				x								

6. Teaching and learning methods for disable students:

No.	Teaching Methods	Reason
1	Presentation of the course in digital material	Better access any time
2	Wed communication with students	Better communication with certain cases
3	Asking small groups to do assignments; each composed of low ,medium and high performance students	Knowledge and skills transfer among different levels of students

7. Student Evaluation:

7.1 Student Evaluation methods:

No.	Evaluation Method	Competencies	LO's
1	Periodic exams	A1	a1,a2,b1
2	Semester work(quizzes, sheets, report)	A1	b1,c1
3	Final term examination	A1	a1,a2,b1,c1

7.2 Evaluation Schedule:

No.	Evaluation Method	Weeks
1	Periodic exams	8th
2	Student load	2nd -7th - 9th -14th
3	Final term examination	15th

7.3 weighting of Evaluation:

No.	Evaluation Method	Marks
1	Periodic exams	20
2	Student load	20
3	Final term examination	60
Total		**100**

8. List of References:

No.	Reference List
1	James L. Meriam, L. G. Kraige, J. N. Bolton "Engineering Mechanics Statics and Dynamics" Wiley; 9th edition, (2021).
2	S S Bhavikatti "Engineering Mechanics" New Age International Private Limited; 8th edition, (2021).
3	Hibbeler, R. C. "Engineering Mechanics: Statics and Dynamics 14/e." (2020).

9. Facilities required for teaching and learning:

Facility			
1	Lecture classroom	3	White board
2	Seminar	4	Data Show system

10. Matrix of Competencies and LO's of the course:

No	Topic	Aims	Competencies	LO's
1	Position, Displacement, Velocity, and Acceleration of Particle	1	A1	a1
2	Plane Motion path of Particle	1	A1	a1
3	Description of plane Motion using Cartesian axes	1	A1	a2
4	Projectiles	1	A1	b1
5	Relative motion between particles	1	A1	b1
6	Motion for particle in circular path	1	A1	a2
7	Newton's second law of motion	1	A1	b1
8	Principle of work and energy of motion	1	A1	a2
9	Principle of conservation of mechanical energy	1	A1	a1
10	Principle of impulse and momentum of rigid body	1	A1	c1

Course Coordinator: Dr / Motaz Mostafa
Head of Department: Ass.prof. Amal bahiry
Date of Approval: 2023

Physics 2

(BAS023)

1- Basic Information:

Program Title	All programs
Department Offering the Program	Basic Science and Engineering Department
Department Responsible for the Course	Basic Science and Engineering Department
Course Title	Physics 2
Course Code	BAS023
Year/Level	level 0
Specialization	Major
Authorization Date of Course Specification	-

Teaching hours	Lectures	Exercise	laboratory	Student's load
	2	2	2	4

2- Course Aims:

No.	Aims
1	Master a broad range of engineering physics knowledge and specialized skills, as well as the ability to apply acquired knowledge in real-world situations by applying theories in analytic critical and systemic thinking to identify, diagnose, and solve engineering problems of varying complexity and variation.

3-Competencies:

Competencies	Learning Outcomes (LO'S)

A1. Identify, formulate, and solve complex engineering problems by applying engineering fundamentals, basic science and mathematics.	a1. Define concepts and theories of physics necessary for engineering system analysis. a2. Study solving engineering problems including Einstein's quantum hypothesis, laws of reflection and refraction, interference and diffraction. a3. Define measurement devices in electrical conductivity, basic characteristics, and properties. b2. Select the appropriate solutions for engineering problems including Newton's Rings and design of optical fibers.

4. Course Contents:

No.	Topics	Lecture	Exercise	laboratory	Student load
1	Basic of electricity. Practical: measurement devices in electrical conductivity.	2	2	4	4
2	Column’s law and Gauss’s law. Practical: sensitivity of galvanometer.	4	4	2	8
3	Capacitors and capacitance. Practical: capacitors and capacitance	2	2	2	4
4	Currents and Resistance. Practical: ohm’s law - series connection &parallel connection& resistance colour code& meter bridge - voltmeter resistance.	4	4	10	8
5	Magnetic field and magnetic force. Practical: the inverse square law in magnetism.	4	4	2	8
6	The nature and propagation of light. Practical: the glass prism.	4	4	2	8
7	Optical fiber. Practical: the glass prism.	2	2	2	4
8	Introduction to Quantum theory.	2	2	0	4
9	Laser. Practical:	2	2	0	4

10	Lenses and mirrors. Practical: spherometer- mirrors and lenses.	2	2	4	4
Total		**28**	**28**	**28**	**56**

5. Teaching and learning methods:

No	Topics	Face-to-Face Lecture	Online Lecture	Flipped Classroom	Presentation and movies	Discussion	Problem solving	Brain storming	Projects	Site visits	Self-learning and Research	Cooperative	Discovering	Modeling	lab
1	Basic of electricity. Practical: measurement devices in electrical conductivity.	x	x			x									x
2	Column's law and Gauss's law. Practical: sensitivity of galvanometer.	x	x				x								x
3	Capacitors and capacitance. Practical: capacitors and capacitance	x	x					x							x
4	Currents and Resistance. Practical: ohm's law - series connection &parallel connection& resistance color code& meter bridge - voltmeter resistance.	x	x			x	x								x

5	Magnetic field and magnetic force. Practical: the inverse square law in magnetism.	x	x			x									x
6	The nature and propogation of light. Practical: the glass prism.	x	x				x								x
7	Optical fiber. Practical: the glass prism.	x	x					x							x
8	Introduction to Quantum theory.	x	x				x								x
9	Laser. Practical:	x	x					x							x
10	Lenses and mirrors. Practical: spherometer-mirrors and lenses.	x	x				x								x

6. Teaching and learning methods for disable students:

No.	Teaching Methods	Reason
1	Presentation of the course in digital material	Better access any time
2	Web communication with students	Better communication with certain cases
3	Asking small groups to do assignments each composed of low, medium and high performance students.	Knowledge and skills transfer among different levels of students

7. Student Evaluation:

7.1 Student Evaluation method:

No.	Evaluation Method	Competencies	LO's
1	Periodic exams	A1	a1,a3
2	Semester work(quizzes, sheets, report)	A1	a1,a3
3	Final term examination	A1	a1,a2,b2
4	Practical exam	A1	a2,b2

7.2 Evaluation Schedule:

No.	Evaluation Method	Weeks
1	Periodic exams	8th
2	Student load	5th ,7th ,14th
3	Final term examination	15th

7.3 weighting of Evaluation:

No.	Evaluation Method	Marks
1	Periodic exams	30
2	final examination	75
3	Practical examination	15
4	Student load	30
Total		**150**

8. List of References:

No.	Reference List
1	Shankar, Ramamurti. Fundamentals of Physics II. Yale University Press, 2020.
2	Peter J. Williams ; Firas Mansour ; Robert L. Hawkes ; (Nuclear physicist) Javed Iqbal ; Marina Milner-Bolotin. Physics for scientists and engineers : an interactive approach, Nelson Education Ltd., Year: 2019
3	David Halliday, Robert Resnick, Jearl Walker. Fundamentals of Physics, 9th Edition, Binder Ready Version,2019
4	Serway, Raymond A., and John W. Jewett. Physics for scientists and engineers. Cengage learning, 2018.

9. Facilities required for teaching and learning:

No.	Facility
1	Lecture classroom
2	Laboratory
3	Presenter
4	White board

5	Data show system

10. Matrix of Competencies and LO's of the course:

No.	Topic	Aims	Competencies	LO's
1	Basic of electricity. Practical: measurement devices in electrical conductivity.	1	A1	a1,a3
2	Column's law and Gauss's law. Practical: sensitivity of galvanometer.	1	A1	a1
3	Capacitors and capacitance. Practical: capacitors and capacitance	1	A1	a1
4	Currents and Resistance. Practical: ohm's law - series connection &parallel connection& resistance colour code& meter bridge - voltmeter resistance.	1	A1	a1,a3
5	Magnetic field and magnetic force. Practical: the inverse square law in magnetism.	1	A1	a1
6	The nature and propogation of light. Practical: the glass prism.	1	A1	a2
7	Optical fiber. Practical: the glass prism.	1	A1	b2
8	Introduction to Quantum theory.	1	A1	**a2**
9	Laser. Practical:	1	A1	b2
10	Lenses and mirrors. Practical: spherometer- mirrors and lenses.	1	A1	a2,b2

Course Coordinator: : Ass.prof .Amal Bahiry
Head of Department: Ass.prof. Amal bahiry
Date of Approval: 2023

Production Engineering
(BAS024**)**

1- Basic Information:

Program Title	All Programs
Department Offering the Program	Basic Science and Engineering Department
Department Responsible for the Course	Basic Science and Engineering Department
Course Title	Production Engineering
Course Code	BAS024
Year/Level	Level 0
Specialization	Major
Authorization Date of Course Specification	-

Teaching hours	Lectures	Exercise	laboratory	Student's load
	3	-	2	4

2- Course Aims:

No.	Aims
1	Master a broad range of production engineering knowledge and specialized skills, as well as the ability to apply acquired knowledge in real-world situations.
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	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.

3- Competencies :

Competencies	Learning Outcomes (LO’S)

A3. Apply engineering design processes to produce cost-effective solutions that meet specified needs with consideration for global, cultural, social, economic and environmental.	c1. Apply engineering knowledge to improve products of modern tools, systems and procedure, to make the engineering process more balanced costs, benefits, safety, quality and reliability and environmental impact. c2. Apply safe systems including the use laboratory and field equipment competently
A6. Plan, supervise and monitor of production process, taking into consideration other trades requirements.	a1. Show the conventional procedures and characterization of common engineering materials and components. c2. Acquire production skills.
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.
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.

4. Course Contents:

No.	Topics	Lecture	Exercise	laboratory	Student load

1	The engineering substances and its properties Practical: engineering materials	3	-	2	4
2	Heating and cooling diagrams Practical: iron and steel production	3	-	2	4
3	Heating equilibrium diagrams Practical : heat treatment	3	-	2	4
4	Alloys - Casting operation (sand casting and the preparation of the mold) Practical: metal casting & mold for a sand casting& carpenter workshop	6	-	4	4
5	Forming processes (cold and hot forming: forging rolling – Wire drawing – Blanking and piercing - Deep drawing - The extrusion) Practical: metal forming	6	-	4	4
6	Processes of metal connections (the riveting – welding with its types sticking) Practical: metal joining process	6	-	2	4
7	Cutting machining: Lathing - Shaping – Drilling –Milling - Grinding – Work Piece fixation - Cutting tools fixation - Specifications of the operating machine) Practical: carpenter workshop	6	-	2	4
8	Methods of solving problems Practical: metal machining	3	-	2	4
9	Measuring tools (venire caliper – micrometers and its types) Practical: measurement tools	3	-	4	8
10	Production cycle	3	-	4	
	production efficiency - Industrial safety Practical training in the different workshops				8
Total		**42**	**-**	**28**	**56**

5. Teaching and learning methods:

No	Topics	Face-to-Face Lecture	Online Lecture	Flipped Classroom	Presentation and movies	Discussion	Problem solving	Brain storming	Projects	Site visits	Self-learning and Research	Cooperative	Discovering	Modeling	lab
1	The engineering substances and its properties Practical: engineering materials	x	x			x									x
2	Heating and cooling diagrams Practical: iron and steel production	x	x												x
3	Heating equilibrium diagrams Practical : heat treatment	x	x	x											x
4	Alloys - Casting operation (sand casting and the preparation of the mold) Practical: metal casting & mold for a sand casting& carpenter workshop	x													x
5	Forming processes (cold and hot forming: forging rolling – Wire drawing – Blanking and piercing - Deep drawing - The	x	x												x
	extrusion) Practical: metal forming														

6	Processes of metal connections (the riveting – welding with its types sticking) Practical: metal joining process	**x**	**x**												**x**
7	Cutting machining: Lathing - Shaping – Drilling –Milling - Grinding – Work Piece fixation - Cutting tools fixation - Specifications of the operating machine) Practical: carpenter workshop	**x**	**x**												**x**
8	Methods of solving problems Practical: metal machining	**x**	**x**			**x**	**x**								**x**
9	Measuring tools (venire caliper – micrometers and its types) Practical: measurement tools	**x**	**x**												**x**
10	Production cycle production efficiency - Industrial safety Practical training in the different workshops	**x**	**x**			**x**									**x**

6. Teaching and learning methods for disable students:

No.	Teaching Methods	Reason
1	Presentation of the course in digital material	Better access any time
2	Web communication with students	Better communication with certain cases
3	Asking small groups to do assignments each composed of low, medium and high performance students.	Knowledge and skills transfer among different levels of students

7. Student Evaluation:

7.1 Student Evaluation method:

No.	Evaluation Method	Competencies	LO's
1	Periodic exams	A3/A9	c1,d1, d2, d3
2	Semester work(quizzes, sheets report),	A5	a1,b1,c1,d1
3	Practical Exam	A6	a1,c2
4	Final term examination	A3/A9	c2,d1, d2, d3

7.2 Evaluation Schedule:

No.	Evaluation Method	Weeks
1	Periodic exams	8th
2	Student load	7th,9th ,14th
3	Final term examination	15th

7.3 weighting of Evaluation:

No.	Evaluation Method	Marks
1	Periodic exams	20
2	final examination	75
3	Practical examination	10
4	Student load	20
	Total	**125**

8. List of References:

No.	Reference List
1	Shanker, Kripa, Shankar, Ravi, Sindhwani, Rahu "Advances in Industrial and Production Engineering" 1st edition, Springer Nature Singapore Pte Ltd. (2018).
2	Jeff Hansen "Manufacturing and Production Engineering: Planning and Control" Willford Press (2018).

9. Facilities required for teaching and learning:

No.	Facility
1	Lecture classroom

2	Production engineering workshops
2	Presenter
3	White board
4	Data show system
5	Sound system

10. Matrix of Competencies and LO's of the course:

No.	Topic	Aims	Competencies	LO's
1	The engineering substances and its properties Practical: engineering materials	1	A9, A6	(d1,d2,d3), (a1,c2)
2	Heating and cooling diagrams Practical: iron and steel production	1	A5,A3	(a1,b1,c1,d1),(c1,c2)
3	Heating equilibrium diagrams Practical : heat treatment	1	A5	(a1,b1,c1,d1)
4	Alloys - Casting operation (sand casting and the preparation of the mold) Practical: metal casting & mold for a sand casting& carpenter workshop	1,3	A3	c1,c2
5	Forming processes (cold and hot forming: forging rolling – Wire drawing – Blanking and piercing - Deep drawing - The	1,2	A3	c1,c2

	extrusion) Practical: metal forming			
6	Processes of metal connections (the riveting – welding with its types sticking) Practical: metal joining process	1,3	A3	c1,c2
7	Cutting machining: Lathing - Shaping – Drilling –Milling - Grinding – Work Piece fixation - Cutting tools fixation - Specifications of the operating machine) Practical: carpenter workshop	1,2,3	A6	a1,c2
8	Methods of solving problems Practical: metal machining	1,3	A5,A9	(a1,b1,c1,d1),(d1,d2,d3)
9	Measuring tools (venire caliper – micrometers and its types) Practical: measurement tools	1,3	A3	c1
10	Production cycle production efficiency - Industrial safety Practical training in the different workshops	1,3	A6	c2

Course Coordinator: Dr. Motaz Mostafa

Head of Department: Ass.prof. Amal bahiry

Date of Approval: 2023

Introduction to Engineering and Environment
(BAS025**)**

1-Basic Information:

Program Title	All programs
Department Offering the Program	Basic Science and Engineering Department
Department Responsible for the Course	Basic Science and Engineering Department
Course Title	Introduction to Engineering and Environment
Course Code	BAS025
Year/Level	level 0
Specialization	Basics
Authorization Date of Course Specification	-

Teaching hours	**Lectures**	**Exercise**	**laboratory**	**Student's load**
	2	-	-	2

2- Course Aims:

No.	**Aims**
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

3- Competencies :

Competencies	**Learning Outcomes (LO'S)**
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.	**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.

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.
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. Professionally merge the engineering knowledge, understanding, and feedback to improve design, products and/or services.
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

4. Course Contents:

No.	Topics	Lecture	Exercise	laboratory	Student load
1	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.	10	-	-	10
2	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	2	-	-	2
3	sources of environmental pollution and method of control (air pollution – water pollution – solid wastes pollution –noise)	4	-	-	4
4	Economics of environmental pollution control – legislations for the environment protection.	12	-	-	12
Total		**28**	**-**	**-**	**28**

5. Teaching and learning methods:

No	Topics	Face-to-Face Lecture	Online Lecture	Flipped Classroom	Presentation and movies	Discussion	Problem solving	Brain storming	Projects	Site visits	Self-learning and Research	Cooperative	Discovering	Modeling	lab
1	Engineering concepts: What is engineering – international	x	x								x				
	classification for the engineering jobs – relation between engineering development and environment economic and social development – engineering branches – ethics of the engineering jobs.														
2	Introduction to environmental science: the importance of studying environmental science	x	x								x				
3	Modern technology and its effect on the environment – quality of the environment and development elements	x	x	x							x				

4	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.	x	x	x							x				

6. Teaching and learning methods for disable students:

No.	Teaching Methods	Reason
1	Presentation of the course in digital material.	Better access any time.
2	Asking small groups to do assignments; each composed of low, medium, and high performance students.	Knowledge and skills transfer among different levels of students.

7. Student Evaluation:

7.1 Student Evaluation method:

No.	Evaluation Method	Competencies	LO’s
1	Periodic exams	A3/A4	a2,a3,b1/a1
2	Semester work(quizzes, sheets, report)	A10	d1,d2
3	Final Term Examination	A3/B2	a2,a3,b1,c1/d1

7.2 Evaluation Schedule:

No.	Evaluation Method	Weeks
1	Student load	2_{nd}, 7_{th} , 9_{th}
2	Periodic exams	8_{th}
3	Final Term Examination	15_{th}

7.3 Weighting of Evaluation:

No.	Evaluation Method	Marks
1	Periodic exams	10
2	Student load	15
3	Final-term examination	50
Total		**75**

8. List of References:

No.	Reference List
1	د. جمال صالح السلامة من الكوارث الطبيعية والمخاطر البشرية، دار الشروق ،2019
2	Raju, Fundamental of air pollution, Oxyford&IBH, 2019.

9. Facilities required for teaching and learning:

No.	Facility
1	Seminar
2	Lecture Classroom
3	White Board
4	Data Show system

10. Matrix of Competencies and LO's of the course:

No.	Topic	Aims	Competencies	LO's
1	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.	3	A3/B2	a2,a3,b1,c1/d1
2	Introduction to environmental science: the importance of studying environmental science	3	A4	(d1)
3	Modern technology and its effect on the environment – quality of the environment and development elements	3	A10	d1,d2

4	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.	3	A3/A4/B2	(a2),(a1),(d1)

Course Coordinator: Dr. Ramadan Elkateb
Head of Department: Ass.prof. Amal bahiry
Date of Approval: 2023

Technical English Language 1
(BAS026**)**

1-Basic Information:

Program Title	All Programs
Department Offering the Program	Basic Science and Engineering Department
Department Responsible for the Course	Basic Science and Engineering Department
Course Title	Technical English Language 1
Course Code	BAS026
Year/Level	level 0
Specialization	Major
Authorization Date of Course Specification	-

Teaching hours	**Lectures**	**Exercise**	**laboratory**	**Student's load**
	2	-	2	3

2- Course Aims:

No.	**Aims**
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.

3- Competencies :

Competencies	**Learning Outcomes (LO'S)**
A8. Communicate effectively – graphically, verbally and in writing – with a range of audiences using contemporary tools.	d1. Communicate effectively with a range of audiences using contemporary tools.

4. Course Contents:

No.	**Topics**	**Lecture**	**Exercise**	**laboratory**	**Student load**
1	Engineering Lab. : skills in English Lesson 1 Bob's day at work & Lesson 2 Bob returns home with bad news	6	-	6	9

2	A private flat Lab. : skills in English Lesson 3 Ted's day at school	**2**	-	2	3
3	Book shelves Lab. : skills in English	**2**	-	2	3
	Lesson 4 Nicole's day at school				
4	Bridges Lab. : skills in English Lesson 5 Ted goes out for the evening Grammar Topics	**4**	-	4	6
5	Reinforced concrete Lab. : skills in English Lesson 6 Susan stays home and bake cookies & Lesson 7 Susan hires Bob to run her own business	**4**	-	4	6
6	Surveying Lab. : skills in English Lesson 8 Ted forms a rock band & Lesson 9 Nicole for president	**4**	-	4	6
7	Hydraulic works Lab. : skills in English Lesson 10 Bob visits the village market	**4**	-	4	6
8	Soil mechanics and foundations Lab. : skills in English Grammar topics		-	2	3
Total		**28**	**-**	**28**	**42**

5. Teaching and learning methods:

No	Topics	Face-to-Face Lecture	Online Lecture	Flipped Classroom	Presentation and movies	Discussion	Problem solving	Brain storming	Projects	Site visits	Self-learning and Research	Cooperative	Discovering	Modeling	lab
1	Engineering Lab. : skills in English Lesson 1 Bob's day at work & Lesson 2 Bob returns home with bad news	x	x		x										x
2	A private flat Lab. : skills in English Lesson 3 Ted's day at school	x	x												x
3	Book shelves Lab. : skills in English Lesson 4 Nicole's day at school	x	x												x
4	Bridges Lab. : skills in English Lesson 5 Ted goes out for the evening Grammar Topics	x	x		x										x

5	Reinforced concrete Lab. : skills in English Lesson 6 Susan stays home and bake cookies & Lesson 7 Susan hires Bob to run her own business	**x**	**x**		**x**										**x**
6	Surveying Lab. : skills in English Lesson 8 Ted forms a rock band & Lesson 9 Nicole for president	**x**	**x**												**x**
7	Hydraulic works Lab. : skills in English Lesson 10 Bob visits the village market	**x**	**x**												**x**
8	Soil mechanics and foundations Lab. : skills in English Grammar topics	**x**	**x**												**x**

6. Teaching and learning methods for disable students:

No.	Teaching Methods	Reason
1	Presentation of the course in digital material	Better access any time
2	Asking small groups to do assignments; each composed of low, medium, and high performance students.	Knowledge and skills transfer among different level of students.

7. Student Evaluation:

7.1 Student Evaluation method:

No.	Evaluation Method	Competencies	LO's
1	Periodic exams	A8	d1
2	Semester work(quizzes, sheets, report)	A8	d1
3	Practical exam	A8	d1

4	Final term examination	A8	d1

7.2 Evaluation Schedule:

No.	Evaluation Method	Weeks
1	Periodic exams	8th
2	Student load	7th,9th
3	Practical examination	14th
4	Final term examination	15th

7.3 weighting of Evaluation:

No.	Evaluation Method	Marks
1	Periodic exams	20
2	Practical examination	10
3	Student load	20
4	Final-term examination	50
Total		**100**

8. List of References:

No.	Reference List
1	Gerald J. Alred, Walter E. Oliu, Charles T. Brusaw "The Handbook of Technical Writing" Bedford; 12th Ed, (2020).
2	Raymond Murphy "English Grammar in Use" Cambridge University Press; 5th edition, (2019).

9. Facilities required for teaching and learning:

No.	Facility
1	Lecture classroom
2	Computer lab.

3	Seminar
4	White board
5	Data Show system

10. Matrix of Competencies and LO's of the course:

No.	Topic	Aims	Competencies	LO's
1	Engineering Lab. : skills in English Lesson 1 Bob's day at work & Lesson 2 Bob returns home with bad news	5	A8	d1
2	A private flat Lab. : skills in English Lesson 3 Ted's day at school	5	A8	d1
3	Book shelves Lab. : skills in English Lesson 4 Nicole's day at school	5	A8	d1
4	Bridges Lab. : skills in English Lesson 5 Ted goes out for the evening Grammar Topics	5	A8	d1

5	Reinforced concrete Lab. : skills in English Lesson 6 Susan stays home and bake cookies & Lesson 7 Susan hires Bob to run her own business	5	A8	d1
6	Surveying Lab. : skills in English Lesson 8 Ted forms a rock band & Lesson 9 Nicole for president	5	A8	d1
7	Hydraulic works Lab. : skills in English Lesson 10 Bob visits the village market	5	A8	d1
8	Soil mechanics and foundations Lab. : skills in English Grammar topics	5	A8	d1

Course Coordinator: Dr / Doaa El-Sherbiny
Head of Department: Ass.prof. Amal bahiry
Date of Approval: 2023

Human Rights
(BAS027**)**

1. Basic Information:

Program Title	All Programs
Department Offering the Program	Basic Science and Engineering Department
Department Responsible for the Course	Basic Science and Engineering Department
Course Title	Technical English Language 1
Course Code	BAS027
Year/Level	level 0
Specialization	Major
Authorization Date of Course Specification	-

Teaching hours	**Lectures**	**Exercise**	**laboratory**	**Student's load**
	2	-	-	2

2. Course Aims:

No.	**Aims**
1	Apply knowledge of engineering technology to express one's say and write technical reports

3. Intended Learning Outcomes (ILO'S):

Competencies	**Learning Outcomes (LO'S)**
A8. Communicate effectively – graphically, verbally and in writing – with a range of audiences using contemporary tools.	d1. Communicate effectively with a range of audiences using contemporary tools.

4. Course Contents:

No.	Topics	Lecture	Exercise	laboratory	Student load
1	الإلمام بأهمية حقوق الإنسان والنشأة التاريخية لتلك الحقوق والمدارس الفقهية لتأصيل تلك الحقوق.	2	-	-	**2**
2	أحكام 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	4	-	-	**4**
3	الأصول التاريخية الفلسفية لحقوق الإنسان	4	-	-	**4**
	المصادر الدولية لحقوق الإنسان (العالمية والإقليمية) المصادر الوطنية لحقوق الإنسان				
4	الأجهزة العالمية القائمة على حماية حقوق الإنسان)أجهزة الأمم المتحدة(الحماية الوطنية لحقوق الإنسان	6	-	-	**6**
5	حقوق الإنسان في الشريعة الإسلامية عرض لبعض طوائف حقوق الإنسان	12	-	-	**12**
Total		**28**	**-**	**-**	**28**

5. Teaching and learning methods:

No	Topics	Face-to-Face Lecture	Online Lecture	Flipped Classroom	Presentation and movies	Discussion	Problem solving	Brain storming	Projects	Site visits	Self-learning and Research	Cooperative	Discovering	Modeling	lab
1	الإلمام بأهمية حقوق الإنسان والنشأة التاريخية لتلك الحقوق والمدارس الفقهية لتأصيل تلك الحقوق	x	x		x										x

2	أحكام 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	x	x												x
3	الأصول التاريخية الفلسفية لحقوق الإنسان المصادرالدولية لحقوق الإنسان(العالمية والإقليمية) المصادرالوطنية لحقوق الإنسان	x	x												x
4	الأجهزة العالمية القائمة على حماية حقوق الإنسان)أجهزة الأمم المتحدة(الحماية الوطنية لحقوق الإنسان	x	x		x										x
5	حقوق الإنسان في الشريعة الإسلامية عرض لبعض طوائف حقوق الإنسان	x	x		x										x

6. Teaching and learning methods for disable students:

No.	Teaching Methods	Reason
1	Presentation of the course in digital material	Better access any time
2	Asking small groups to do assignments; each composed of low, medium, and high performance students.	Knowledge and skills transfer among different level of students.

7. Student Evaluation:

7.1 Student Evaluation method:

No.	Evaluation Method	Competencies	LO's
1	Periodic exams	A8	d1
2	Semester work(quizzes, sheets, report)	A8	d1

3	Practical exam	A8	d1
4	Final term examination	A8	d1

7.2 Evaluation Schedule:

No.	Evaluation Method	Weeks
1	Periodic exams	8th
2	Student load	7th,9th
4	Final term examination	15th

7.3 weighting of Evaluation:

No.	Evaluation Method	Marks
1	Periodic exams	10
2	Student load	5
3	Semester work	5
4	Final-term examination	30
Total		**50**

8. List of References:

No.	Reference List
1	Jack Donnelly "International Human Rights" Routledge; 6th edition, (2020).
2	Daniel Moeckli, Sangeeta Shah, Sandesh Sivakumaran, David Harris "International Human Rights Law" Oxford University Press; 3rd edition, (2018).

9. Facilities required for teaching and learning:

No.	Facility
1	Lecture classroom
2	Computer lab.
3	Seminar

4	White board
5	Data Show system

10. Matrix of Competencies and LO's of the course:

No.	Topic	Aims	Competencies	LO's
1	الإلمام بأهمية حقوق الإنسان والنشأة التاريخية لتلك الحقوق والمدارس الفقهية لتأصيل تلك الحقوق	1	A8	d1
2	أحكام 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	1	A8	d1
3	الأصول التاريخية الفلسفية لحقوق الإنسان المصادرالدولية لحقوق الإنسان(العالمية والإقليمية) المصادرالوطنية لحقوق الإنسان	1	A8	d1
4	الأجهزة العالمية القائمة على حماية حقوق الإنسان)أجهزة الأمم المتحدة(الحماية الوطنية لحقوق الإنسان	1	A8	d1
5	حقوق الإنسان في الشريعة الإسلامية عرض لبعض طوائف حقوق الإنسان	1	A8	d1

Course Coordinator: Dr Ibrahim Taha
Head of Department: Ass.prof. Amal bahiry
Date of Approval: 2023

Mathematics 3
(BAS111)

1- Basic Information:

Program Title	Chemical Engineering Program
Department Offering the Program	Chemical EngineeringDepartment
Department Responsible for the Course	Basic Science and Engineering Department
Course Title	Mathematics 3
Course Code	BAS111
Year/Level	Level: 1
Specialization	Major
Authorization Date of Course Specification	-

Teaching hours	**Lectures**	**Exercise**	**laboratory**	**Student's load**
	2	2	-	4

2- Course Aims:

No.	Aims
1	Master a broad range of fundamental Mathematical engineering knowledge and solve of ordinary differential equations and partial differentiation applications, as well as the ability to apply acquired knowledge of ordinary differential equations and partial differentiation applications in real-world situations by applying theories and abstract thinking in analytic critical and systemic thinking to identify, diagnose, and solve multi integrations of mathematical engineering .

3- Competencies :

Competencies	Learning Outcomes (LO'S)
A1. Identify, formulate, and solve complex engineering problems by applying engineering fundamentals, basic science and mathematics**.**	a1. Understand the relevant engineering mathematical of ordinary differential equations and applications of Partial differentiation equations. a2. Describe the effect of mathematical engineering principles and theories that apply in the most fundamental problems . a3. Define the basic concepts of ordinary differential equations and Partial differentiation equations b1. Applying the basics of ordinary differential equations and applications of Partial differentiation equations in engineering problems.

4. Course Contents:

No.	Topics	Lecture	Laboratory	Exercise	Student's load
1	• **maximum and minimum values in more than one variable**	4	-	**4**	8
2	• **directional analysis the directional differential effects**	**4**	-	**4**	8
3	• **multi integrations and its applications (the curved and the orthogonal axis)**	**4**	-	**4**	8
4	**Gauss- Stokes theory - the endless series and function expansion – basic concepts for the convergence and divergence.**	4	-	**4**	8

5	• The first order (the equations which can be separated, homogeneous,	4	-	4	8
6	exact and linear) - the ordinary differential equations from the second order and higher orders (with constant and variable coefficients	4	-	4	8
7	systems from the ordinary differential equations– Laplace transfer and its applications in the solution of differential equations	4	-	4	8
Total		28	-	28	56

5. **Teaching and learning methods:**

No	Topics	Face-to-Face Lecture	Online Lecture	Flipped Classroom	Presentation and movies	Discussion	Problem solving	Brain storming	Projects	Site visits	Self-learning and Research	Cooperative	Discovering	Modeling	lab
1	maximum and minimum values in more than one variable	x	x			x	x								

2	• **directional analysis the directional differential effects**	**x**	**x**			**x**		**x**							
3	**multi integrations and its applications (the curved and the orthogonal axis)**	**x**	**x**			**x**	**x**								
4	**Gauss- Stokes theory - the endless series and function expansion – basic concepts for the convergence and divergence.**	**x**	**x**			**x**		**x**							
5	• **The first order (the equations which can be separated,**	**x**	**x**			**x**	**x**								
6	**homogeneous, exact and linear) - the ordinary differential equations from the second order and higher orders (with constant and variable coefficients**	x	x			x	x								
7	**systems from the ordinary differential equations– Laplace transfer and its applications in the solution of differential equations**	**x**	**x**			**x**		**x**							

6. Teaching and learning methods for disable students:

No.	Teaching Methods	Reason
1	Presentation of the course in digital material	Better access any time
2	Wed communication with students	Better communication with certain cases

3	Asking small groups to do assignments; each composed of low ,medium and high performance students	Knowledge and skills transfer among different levels of students

7. Student Evaluation:

7.1 Student Evaluation method:

No.	Evaluation Method	Competencies	LO's
1	Periodic exams	A1	a1,a2
2	Semester work(quizzes, sheets, report)	A1	a2,a3
3	Final term examination	A1	a1,a2,a3,b1

7.2 Evaluation Schedule:

No.	Evaluation Method	Weeks
1	Periodic exams	8th
2	Student load	2nd -7th - 14th
3	Final term examination	15th

7.3 weighting of Evaluation:

No.	Evaluation Method	Marks
1	Periodic exams	30
2	Student load	30
3	Final term examination	90
Total		**150**

8. List of References:

No.	Reference List
1	Harumi Hattori " Partial Differential Equations: Methods, Applications and Theories" WSPC; 2nd edition (2019).
2	Noboru Nakanishi, Seto Kenji "Differential Equations And Their Applications" WSPC;(2023).

3	Yuefan Deng "Lectures, Problems and Solutions for Ordinary Differential Equations" 2nd edition, WSPC; Second Edition (2017).

9. Facilities required for teaching and learning:

Facility			
1	Lecture classroom	3	White board
2	Seminar	4	Data Show system

10. Matrix of Competencies and LO's of the course:

No.	**Topic**	**Aims**	**Competencies**	**LO's**
1	**maximum and minimum values in more than one variable**	**1**	**A1**	**a1,a2**
2	• **directional analysis** **the directional differential effects**	**1**		
3	**multi integrations and its applications (the curved and the orthogonal axis)**	**1**	**A1**	**a2**
4	**Gauss- Stokes theory - the endless series and function expansion – basic concepts for the convergence and divergence.**	**1**	**A1**	**a1,a3**
5	• **The first order (the equations which can be separated,** • **.**	**1**	**A1**	**a3**
6	**homogeneous, exact and linear) - the ordinary differential equations from the second order and higher orders (with constant and variable coefficients**	**1**	**A1**	**a3**
7	**systems from the ordinary differential equations– Laplace transfer and its applications in the solution of differential equations**	**1**	**A1**	**b1**

Course Coordinator: Dr / Samar Madian

Head of Department: Ass.prof. Amal bahiry

Date of Approval: 2023

Electrical Engineering Fundamentals
(BAS112**)**

1- Basic Information:

Program Title	Chemical Engineering Program
Department Offering the Program	Chemical EngineeringDepartment
Department Responsible for the Course	Basic Science and Engineering Department
Course Title	Electrical Engineering Fundamentals
Course Code	BAS112
Year/Level	Level 1
Specialization	Major
Authorization Date of Course Specification	-

Teaching hours	**Lectures**	**Exercise**	**laboratory**	**Student's load**
	3	2	-	4

2- Course Aims:

No.	Aims
4	Use the modern electrical engineering techniques, skills, and current engineering tools required for engineering practice related to electrical engineering techniques by taking full responsibility for one's own learning and developmen
7	Design a system, component, and process to meet recent technological advancements using computer systems in Electrical, Electronics and Communication engineering

3-Competencies:

Competencies	Learning Outcomes (LO'S)
A1. Identify, formulate, and solve complex engineering problems by applying engineering fundamentals, basic science and mathematics.	a1. Describe the relevant mathematical principles and theories related to electrical engineering fundamentals . a2. Explain the scientific principles and theories that apply to the electrical engineering. b1. Use math ideas and theories that are applicable to the electrical engineering. b2. Use scientific concepts and theories that are relevant to electrical engineering. c1. Solve complex engineering problems related to electrical engineering by applying the concepts and the theories of mathematics c2. Identify complex engineering problems by applying the concepts and the theories of sciences, appropriate to the electrical engineering.
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 electrical engineering principles. 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.

4. Course Contents:

No.	Topics	Lecture	Exercise	laboratory	Student load
1	Direct Current	3	2	-	4
2	Theory of electric circuits	8	6	-	12
3	Delta and Star connections	2	1	-	2
4	Sine A.C and D.C circuits	8	5	-	10
5	Time vectors diagram	3	2	-	4
6	Electric power and power factor in A.C circuits	3	2	-	4

7	3-Phase current - Electric machines - D.C machines	6	4	-	8
8	Transformers	3	2	-	4
9	Induction and synchronous machines	3	2	-	4
10	Fractional power machine	3	2	-	4
Total		**42**	**28**	**-**	**56**

5. Teaching and learning methods:

No	Topics	Face-to-Face Lecture	Online Lecture	Flipped Classroom	Presentation and movies	Discussion	Problem solving	Brain storming	Projects	Site visits	Self-learning and Research	Cooperative	Discovering	Modeling	lab
1	Direct Current	x	x			x									
2	Theory of electric circuits	x	x			x									
3	Delta and Star connections	x	x			x	x								
4	Sine A.C and D.C circuits	x	x			x		x							
5	Time vectors diagram	x	x			x	x								
6	Electric power and power factor in A.C circuits	x	x			x									
7	3-Phase current - Electric machines - D.C machines	x	x			x	x								
8	Transformers	x	x			x									
9	Induction and synchronous machines	x	x			x									
10	Fractional power machine	x	x			x		x							

6. Teaching and learning methods for disable students:

No.	Teaching Methods	Reason
1	Presentation of the course in digital material	Better access any time
2	Web communication with students	Better communication with certain cases
3	Asking small groups to do assignments; each composed of low, medium and high performance students.	Knowledge and skills transfer among different levels of students

7. Student Evaluation:

7.1 Student Evaluation method:

No.	Evaluation Method	Competencies	LO's
1	Periodic exams	A1	a1,a2,b1,b2
2	Semester work(quizzes, sheets, report)	A1	b1,c2
3	Final term examination	A2	a1,b3,b4, c1

7.2 Evaluation Schedule:

No.	Evaluation Method	Weeks
1	Periodic exams	8th
2	Student load	2nd ,7th,9th,14th
3	Final term examination	15th

7.3 weighting of Evaluation:

No.	Evaluation Method	Marks
1	Periodic exams	30
2	Student load	30
3	final examination	90
	Total	**150**

8. List of References:

No.	Reference List
1	Fundamentals of electric circuits alexander sadiku 4th edition.2019.
2	Fundamentals of Electrical Circuit Analysis, March 2018

3	Thomas Talavage (Author), T. Arthur Terlep "Electrical Engineering Fundamentals" Independently published (2019).
4	Viktor Hacker and Christof Sumereder " Electrical Engineering: Fundamentals" De Gruyter Oldenbourg (2019).

9. Facilities required for teaching and learning:

No.	Facility
1	Lecture classroom
2	Presenter
3	White board
4	Data show system
5	Wireless internet
6	Sound system

10. Matrix of Competencies and LO's of the course:

No.	Topic	Aims	Competencies	LO's
1	Direct Current	4	A1	a1, a2,b1,b2
2	Theory of electric circuits	4	A1	a1, a2,b1,b2
3	Delta and Star connections	4	A1	a1, a2,b1,b2
4	Sine A.C and D.C circuits	4	A1	a1, a2,b1,b2
5	Time vectors diagram	4	A1	a1, a2,b1,b2
6	Electric power and power factor in A.C circuits	4	A1	a1,c2
7	3-Phase current - Electric machines - D.C machines	7	A2	a1,b3
8	Transformers	7	A2	b4,c1
9	Induction and synchronous machines	7	A2	b3,c1
10	Fractional power machine	7	A2	a1,c1

Course Coordinator: Dr. Hossam Abdelfatah
Head of Department: Ass.prof. Amal bahiry

Date of Approval: 2023

Engineering Thermodynamics
(BAS113**)**

1- Basic Information:

Program Title	Chemical Engineering Program
Department Offering the Program	Chemical EngineeringDepartment
Department Responsible for the Course	Basic Science and Engineering Department
Course Title	Engineering Thermodynamics
Course Code	BAS113
Year/Level	level 1
Specialization	Major
Authorization Date of Course Specification	-

Teaching hours	**Lectures**	**Exercise**	**laboratory**	**Student's load**
	3	2	-	4

2- Course Aims:

No.	Aims
1	Master a broad range of engineering thermodynamics knowledge and specialized skills, as well as the ability to apply acquired knowledge in real-world situations by applying thermodynamics laws to identify, diagnose, and solve engineering problems of varying complexity and variation.

3- Competencies :

Competencies	Learning Outcomes (LO'S)
A1. Identify, formulate, and solve complex engineering problems by applying engineering fundamentals, basic science and mathematics.	a1. Demonstrate the thermodynamics laws that apply to the engineering problems. a2. Explain the basic principles of engineering thermodynamics. a3. Study the concepts and theories of mathematical, science necessary for engineering thermodynamic properties for different types of systems. b1. Select the appropriate solutions for engineering problems and system design, gas power cycles, vapor cycles. b2. Using scientific concepts and thermodynamics laws that are relevant to the real life. c1. Modify engineering knowledge and understanding to improve design, products and services, gas power cycles, vapor cycles. c2. Solve complex engineering problems by applying the concepts and the thermodynamics laws.

4. Course Contents:

No.	Topics	Lecture	Exercise	laboratory	Student load
1	Fundamental concepts - Properties of a pure substance	4	2	-	4
2	Equation of state -thermodynamic systems	4	2	-	4
3	Work and heat - First law of thermodynamics; Applications to Systems and Control Volumes	8	6	-	12

4	Second Law of Thermodynamics; Principle of Carnot cycles; Heat engines, Refrigerators and heat pumps	6	4	-	8
5	Principle of the increase of entropy	6	4	-	8
6	Applications to systems and control volumes	8	6	-	12
7	Irreversibility and availability - Power and refrigeration cycles.	6	4	-	8
Total		42	**28**	**-**	**56**

5. Teaching and learning methods:

No	**Topics**	**Face-to-Face Lecture**	**Online Lecture**	**Flipped Classroom**	**Presentation and movies**	**Discussion**	**Problem solving**	**Brain storming**	**Projects**	**Site visits**	**Self-learning and Research**	**Cooperative**	**Discovering**	**Modeling**	**lab**
1	Fundamental concepts - Properties of a pure substance	x	x			x									
2	Equation of state - thermodynamic systems - Work and heat	x	x			x	x								
3	First law of thermodynamics; Applications to Systems and Control Volumes	x	x			x	x								
4	Second Law of Thermodynamics; Principle of Carnot cycles	x	x			x	x								

5	Heat engines, Refrigerators and heat pumps - Principle of the increase of entropy	x	x			x									
6	Applications to systems and control volumes - Irreversibility and availability	x	x			x									
7	Power and refrigeration cycles	x	x			x									

6. Teaching and learning methods for disable students:

No.	Teaching Methods	Reason
1	Presentation of the course in digital material.	Better access any time
2	Web communication with students.	Better communication with certain cases
3	Asking small groups to do assignments; each composed of low, medium and high performance students.	Knowledge and skills transfer among different levels of students

7. Student evaluation:

7.1 Student evaluation method:

No.	Evaluation Method	Competencies	LO's
1	Periodic exams	A1	a1,a2,b1
2	Semester work(quizzes, sheets, report)	A1	c1,c2
3	Final term examination	A1	b1,a3

7.2 Evaluation Schedule:

No.	Evaluation Method	Weeks
1	Periodic exams	8th
2	Student load	2nd ,7th,9th,14th
3	Final term examination	15th

7.3 weighting of Evaluation:

No.	Evaluation Method	Marks
1	Periodic exams	20
2	final examination	75

3	Student load	20
4	Practical /oral	10
	Total	**125**

8. List of References:

No.	Reference List
1	P. K. Nag "Engineering Thermodynamics | 6th Edition" McGraw Hill Education; Sixth edition (2017).
2	Michael J. Moran, Howard N. Shapiro, Daisie D. Boettner, Margaret B. Bailey "Fundamentals of Engineering Thermodynamics" 9th edition Wiley (2018)

9. Facilities required for teaching and learning:

No.	Facility
1	Lecture classroom
2	Presenter
3	White board
4	Data show system

10. Matrix of Competencies and LO’s of the course:

No.	Topic	Aims	Competencies	LO’s

1	Fundamental concepts - Properties of a pure substance	1	A1	a1,a2
2	Equation of state - thermodynamic systems - Work and heat	1	A1	a1,a2
3	First law of thermodynamics; Applications to Systems and Control Volumes	1	A1	a1,a2
4	Second Law of Thermodynamics; Principle of Carnot cycles	1	A1	b1,c1
5	Heat engines, Refrigerators and heat pumps - Principle of the increase of entropy	1	A1	b1,c1
6	Applications to systems and control volumes - Irreversibility and availability	1	A1	a3,c2
7	Power and refrigeration cycles	1	A1	b1,c1

Course Coordinator: Dr. A. E. Kabeel
Head of Department: Ass.prof. Amal bahiry
Date of Approval: 2023

Technical English Language 2
(BAS114**)**

1- Basic Information:

Program Title	Chemical Engineering Program
Department Offering the Program	Chemical EngineeringDepartment
Department Responsible for the Course	Basic Science and Engineering Department
Course Title	Technical English Language 2
Course Code	BAS114
Year/Level	level 1
Specialization	Major
Authorization Date of Course Specification	-

Teaching hours	**Lectures**	**Exercise**	**laboratory**	**Student's load**
	2	-	2	3

2- Course Aims:

No.	**Aims**
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.

3-Competencies:

Competencies	**Learning Outcomes (LO'S)**
A8. Communicate effectively – graphically, verbally and in writing – with a range of audiences using contemporary tools.	d1. Communicate effectively. d2. Demonstrate efficient IT capabilities.
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. Professionally merge the language skills in self learning

4. Course Contents:

No.	Topics	Lecture	Exercise	laboratory	Student load
1	Water Lab skills in English : Lesson 1 Bob drives a hard bargain& Lesson 2 Bob's big coolie order& grammar topics	**4**	-	4	6
2	Chemical and physical properties. Lab skills in English Lesson 3 Amber comes over to bake cookies & Lesson 4Amber and Ted heat up the kitchen& grammar topics	**4**	-	4	6
3	Water cycle Lab skills in English lesson 5 Nicole practices her election speech& grammar topics	**2**	-	2	3
4	Human uses Lab skills in English : Grammar topics	**4**	-	4	6
5	Heat transfer Lab skills in English lesson 6 Bob brings the cookies to the village market& lesson 7 Carol tells Bob the good news& grammar topics	**4**	-	4	6
6	Graphic language Lab skills in English : lesson 8 Every one bakes cookies & lesson 9 Nicole's close election & grammar topics	**4**	-	4	6
7	Energy Lab Skills in English lesson 10 Bob gets any angry call from Carol & Grammar topics	**4**	-	4	6
8	Automatic Control Lab Skills in English Grammar topics	**2**	-	2	3
Total		28	**-**	**28**	**42**

5. Teaching and learning methods:

No	Topics	Face-to-Face Lecture	Online Lecture	Flipped Classroom	Presentation and movies	Discussion	Problem solving	Brain storming	Projects	Site visits	Self-learning and Research	Cooperative	Discovering	Modeling	lab
1	Water Lab skills in English : Lesson 1 Bob drives a hard bargain & Lesson 2 Bob's big coolie order & grammar topics	x	x		x										x
2	Chemical and physical properties. Lab skills in English Lesson 3 Amber comes over to bake cookies & Lesson 4Amber and Ted heat up the kitchen & grammar topics	x	x		x										x
3	Water cycle Lab skills in English lesson 5 Nicole practices her election speech & grammar topics	x	x												x
4	Human uses Lab skills in English : Grammar topics	x	x												x

5	Heat transfer Lab skills in English lesson 6 Bob brings the cookies to the village market& lesson 7 Carol tells Bob the good news & grammar topics	x	x												x
6	Graphic language Lab skills in English : lesson 8 Every one bakes cookies & lesson 9 Nicole's close election & grammar topics	x	x												x
7	Energy Lab Skills in English lesson 10 Bob gets any angry call from Carol & Grammar topics	x	x												x
8	Automatic Control Lab Skills in English Grammar topics	x	x												x

6. Teaching and learning methods for disable students:

No.	Teaching Methods	Reason
1	Presentation of the course in digital material	Better access any time
2	Asking small groups to do assignments; each composed of low, medium, and high performance students.	Knowledge and skills transfer among different level of students.

7. Student Evaluation:

7.1 Student Evaluation method:

No.	Evaluation Method	Competencies	LO’s
1	Periodic exams	A8,A10	d1,d2
2	Semester work(quizzes, sheets, report)	A8	d1,d2
3	Practical exam	A8,A10	d1,d2
4	Final term examination	A10	d1,d2

7.2 Evaluation Schedule:

No.	Evaluation Method	Weeks
1	Periodic exams	8th
2	Student load	7th,9th
3	Practical examination	14th
4	Final term examination	15th

7.3 weighting of Evaluation:

No.	Evaluation Method	Marks
1	Periodic exams	20
2	Student load	20
3	Practical examination	10
4	Final term examination	50
Total		**100**

8. List of References:

No.	Reference List
1	David Bonamy "Technical English" Longman Publishing Group 2016
2	Paul J. Hamel "English for Better Jobs 1: Language for Working and Living" Create Space Independent Publishing Platform; 1st edition (2016)/
3	Mahmood Reza Atai, Alireza Zaré Alanagh, Morteza Nasiri and Reza Taherkhani "English for The Students of Engineering" 1st edition, SAMT Publication (2016).

9. Facilities required for teaching and learning:

No.	Facility
1	Lecture classroom
2	Computer lab.

3	Seminar
4	White board
5	Data Show system

10. Matrix of Competencies and LO's of the course:

No.	Topic	Aims	Competencies	LO's
1	Water Lab skills in English : Lesson 1 Bob drives a hard bargain & Lesson 2 Bob's big coolie order & grammar topics	5	A8	d1,d2
2	Chemical and physical properties. Lab skills in English Lesson 3 Amber comes over to bake cookies & Lesson 4Amber and Ted heat up the kitchen & grammar topics	5	A8	d1,d2
3	Water cycle Lab skills in English lesson 5 Nicole practices her election speech & grammar topics	5	A8	d1,d2
4	Human uses Lab skills in English : Grammar topics	5	A10	d2
5	Heat transfer Lab skills in English lesson 6 Bob brings the cookies to the village market& lesson 7 Carol tells Bob the good news & grammar topics	5	A10	d2
6	Graphic language Lab skills in English : lesson 8 Every one bakes cookies & lesson 9 Nicole's close election & grammar topics	5	A10	d2
7	Energy Lab Skills in English lesson 10 Bob gets any angry call from Carol & Grammar topics	5	A10	d1,d2

8	Automatic Control Lab Skills in English Grammar topics	5	A10	d1,d2

Course Coordinator: Dr. Doaa EL-Sherbiny
Head of Department: Ass.prof. Amal bahiry
Date of Approval: 2023

Computer Programming

(BAS115**)**

1- Basic Information:

Program Title	Chemical Engineering Program
Department Offering the Program	Chemical EngineeringDepartment
Department Responsible for the Course	Basic science and Engineering Department
Course Title	Computer Programming
Course Code	BAS115
Year/Level	Level 1
Specialization	Major
Authorization Date of Course Specification	-

Teaching hours	**Lectures**	**Exercise**	**laboratory**	**Student's load**
	2	-	2	4

2- Course Aims:

No.	**Aims**
1	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.

3-Competencies:

Competencies	**Learning Outcomes (LO'S)**
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. Describe an appropriate system by applying "java "language programming. b3.Interpret data problems to identify java programs c1.Choose relevant computer-based software for modelling to analysis java programs
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.
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.

4. Course Contents:

No.	Topics	Lecture	Exercise	laboratory	Student load
1	Basic concepts of programming. Practical: problem analysis& Developing the programs charts& Structured programming	2	-	2	4
2	Introduction Java Applications Practical: Form of the Program& fundamentals of Java programming language and its syntax& Primitive data types, operators, variables &J option pane& scanner Classes.	4	-	4	8
3	Branching [Control Statements]. Practical: programs about (If statement, If -Else, Nested IF, Switch)	2	-	2	4
4	[Iterations] Control Statements. Practical: solved problems about (Repetition statements: for, while, dowhile& Nested loop &Continue, Break.)	4	-	4	8

5	Concepts of object Oriented programming Practical: Examples Of Classes, Inheritance Concept.	2	-	2	4
6	Methods in java. Practical: problems of (Declare method& Message passing& Method overloading)	2	-	2	4
7	Arrays and Array list Practical: Create Array& Matrix& Array List.	4	-	4	8
8	Introduction to java Applets. Practical: java Applets programs.	4	-	4	8
9	Graphical user interface (GUI). Practical: GUI exercises.				
Total		**28**	**-**	**28**	**56**

5. Teaching and learning methods:

No	Topics	Face-to-Face Lecture	Online Lecture	Flipped Classroom	Presentation and movies	Discussion	Problem solving	Brain storming	Projects	Site visits	Self-learning and Research	Cooperative	Discovering	Modeling	lab
1	Basic concepts of programming. Practical: problem analysis & Developing the programs charts& Structured programming	x	x												x

2	Introduction Java Applications Practical: Form of the Program& fundamentals of Java programming language and its syntax& Primitive data types, operators, variables & J option pane & scanner Classes.	x	x			x									x
3	Branching [Control Statements]. Practical: programs about (If statement, If -Else, Nested IF, Switch)	x	x												x
4	[Iterations] Control Statements. Practical: solved problems about (Repetition statements: for, while, do-while& Nested loop &Continue, Break.)	x	x			x									x
5	Concepts of object Oriented programming Practical: Examples Of Classes, Inheritance Concept.	x	x												x
6	Methods in java. Practical: problems of (Declare method& Message passing& Method overloading)	x	x												x
7	Arrays and Array list Practical: Create Array& Matrix& Array List.	x	x												x

8	Introduction to java Applets. Practical: java Applets programs.	x	x												x
9	Graphical user interface (GUI). Practical: GUI exercises.	x	x												x

6. Teaching and learning methods for disable students:

No.	Teaching Methods	Reason
1	Presentation of the course in digital material	Better access any time
2	Web communication with students	Better communication with certain cases
3	Asking small groups to do assignments; each composed of low, medium and high performance students.	Knowledge and skills transfer among different levels of students

7. Student Evaluation:

7.1 Student Evaluation method:

No.	Evaluation Method	Competencies	LO's
1	Periodic exams	A2	b3,c1
2	Semester work (report, quizzes)	A5/A7	a1,b1,c1/d1,d2
3	Final term examination	A2	a1,b3
4	Practical	A8	d1,d2

7.2 Evaluation Schedule:

No.	Evaluation Method	Weeks
1	Periodic exams	8th
2	Student load	14th
3	Final term examination	15th

7.3 weighting of Evaluation:

No.	Evaluation Method	Marks

1	Periodic exams	20
2	final examination	50
3	Practical examination	10
4	Student load	20
	Total	**100**

8. List of References:

No.	Reference List
1	Jeffrey L. Nyhoff, Larry R. Nyhoff "Processing: An Introduction to Programming" ebook (2017).
2	Murali Chemuturi "Computer Programming for Beginners" Taylor & Francis Group; (2018).

9. Facilities required for teaching and learning:

No.	Facility
1	Lecture classroom
2	Computer lab.
3	Presenter
4	White board
5	Data show system

10. Matrix of Competencies and LO's of the course:

No.	Topic	Aims	Competencies	LO's
1	Basic concepts of programming. ❖Practical: problem analysis & Developing the programs charts& Structured programming	1	A2	(a1,b3,c1)
2	Introduction Java Applications	1	A2	(a1,b3,c1)

	❖Practical: Form of the Program & fundamentals of Java programming language and its syntax & Primitive data types, operators, variables& J option pane & scanner Classes.			
3	Branching [Control Statements]. ❖Practical: programs about (If statement, If -Else, Nested IF, Switch)	1	A5,A7	(a1,b1,c1,d1),(d1,d2,d3)
4	[Iterations] Control Statements. ❖Practical: solved problems about (Repetition statements: for, while, do-while& Nested loop &Continue, Break.)	1	A5,A7	(a1,b1,c1,d1),(d1,d2,d3)
5	Concepts of object Oriented programming ❖Practical: Examples Of Classes, Inheritance Concept.	1	A5,A7	(a1,b1,c1,d1),(d1,d2,d3)
6	Methods in java. ❖Practical: problems of (Declare method& Message passing& Method overloading) Arrays and Array list	1	A2/A8	a1/ d1,d2
7	❖Practical: Create Array& Matrix& Array List.	1	A2/A8	a1/ d1,d2
8	Introduction to java Applets. Practical: java Applets programs.	1	A5,A7	(a1,b1,c1,d1),(d1,d2,d3)
9	Graphical user interface (GUI). Practical: GUI exercises.	1	A2/A8	a1/ d1,d2

Course Coordinator: Dr. Amira Elsonbaty

Head of Department: Ass.prof. Amal bahiry

Date of Approval: 2023

Inorganic Chemistry

CHE111

1-Basic Information:

Program Title	Chemical Engineering Program
Department Offering the Program	Chemical Engineering Department
Department Responsible for the Course	Chemical Engineering Department
Course Title	Inorganic Chemistry
Course Code	CHE111
Year/Level	Level 1
Specialization	Major
Authorization Date of Course Specification	-

Teaching hours	Lectures	Exercise	laboratory	Student's load
	2	-	2	5

2-Course Aims:

No.	Aims
6	Analyze data from the inorganic chemistry experiments to manage resources creatively.
8	Consider the impact of inorganic chemical process industries on society, economics, and the environment using fundamental knowledge of chemical process industries.

3-Competencies:

Competencies	Learning Outcomes (LO'S)
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.	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 b2. Conduct basic experiments to learn about the basic properties and features of inorganic reactions, as well as their applications in chemical process industries such as petroleum refining, natural gas processing, petrochemicals, electrochemistry, fertilizers, and ceramics, etc.

	c2. Develop suitable experimentation and/or simulation.
A7. Function efficiently as an individual and as a member of multi-disciplinary and multicultural teams.	d2. Work in stressful environment

4. Course Contents:

No.	Topics	Lecture	Exercise	laboratory	Student load
1	Comparative study for the following groups of materials with focusing on the compounds which are important to the industry Practical • Introduction in investigation for Acidic and basic Radical in sample salts • Dilute HCL group Concentrated H_2SO_4 group	6	-	12	21
2	Chemical bonding	4	-	-	14

3	Representative elements (from Gr.1 to gr.7) Practical • Miscellaneous group • Scheme of identification of acidic radical • Investigation for Basic Radical in sample salts group Dil. HCL • Dil. HCL + H_2S group • NH_4OH + NH_4Cl group • NH4OH + NH4Cl + H2S group	12	-	12	21
4	Nobel gases, Lanthanides and Actinides **Practical** • NH_4OH + NH_4Cl + $(NH_4)_2$ CO_3 group • Scheme of identification of basic Radical	6	-	4	14
Total		**28**	**-**	**28**	**70**

5. Teaching and learning methods:

No	Topics	Face-to-Face Lecture	Online Lecture	Flipped Classroom	Presentation and movies	Discussion	Problem solving	Brain storming	Projects	Site visits	Self-learning and Research	Cooperative	Discovering	Modeling	lab

1	Comparative study for the following groups of materials with focusing on the compounds which are important to the industry Practical Practical • Introduction in investigation for Acidic and basic Radical in sample salts • Dilute HCl group • Concentrated H_2SO_4 group	x	x							x				x
2	Chemical bonding	x	x							x				x
3	Representative elements (from Gr.1 to gr.7) Practical • Miscellaneous group • Scheme of identification of acidic radical • Investigation for Basic Radical in sample salts group Dil. HCl • Dil. HCl + H_2S group • NH_4OH + NH_4Cl group • NH_4OH + NH_4Cl + H_2S group	x	x							x				x

4	Nobel gases, Lanthanides and Actinides **Practical** • NH_4OH + NH_4Cl + $(NH_4)_2$ CO_3 group • Scheme of identification of basic Radical	x	x								x				x

6. Teaching and learning methods for disable students:

No.	Teaching Methods	Reason
1	Presentation of the course in digital material	Better access any time
2	Web communication with students	Better communication with certain cases
3	Asking small groups to do assignments; each composed of low ,medium and high performance students	Knowledge and skills transfer among different levels of students

7. Student evaluation:

7.1 Student evaluation method:

No.	Evaluation Method	Competencies	LO’s
1	Periodic exams	A2	a2,b2
2	Semester work (sheets ,quiz , presentation)	A2/A7	c2/d2
3	Practical Examination	A2/A7	c2/d2
4	Final term examination	A2	a2,b2

7.2 Evaluation Schedule:

No.	Evaluation Method	Weeks
1	Periodic exams	8th
2	Student load	2nd -7th - 9th
3	Practical Examination	14th
4	Final term examination	15th

7.3 weighting of Evaluation:

No.	Evaluation method	Marks

1	Periodic exams	20
2	Student load	20
3	Practical Examination	10
4	Final term examination	75
Total		**125**

8. List of References:

No.	Reference List
1	Mark Weller, Tina Overton, Jonathan Rourke "INORGANIC CHEMISTRY" Oxford University Press; 7th edition, (2018).
2	Dr./ R.D. Madan, Modern inorganic chemistry, S. Chand Publishing, 2019
3	Steve Zumdahl "Chemistry" Cengage Learning; 10th edition, (2017).

9. Facilities required for teaching and learning:

No.	Facility	No.	Facility
1	Lecture classroom	5	Data show system
2	Presenter	6	Sound system
3	White board		
4	Lab		

10. Matrix of Competencies and LO's of the course:

No.	Topic	Aims	Competencies	LO's
1	Atomic structure – periodic table	6	A2	a2
	Practical • Introduction in investigation for Acidic and basic Radical in sample salts • Dilute HCL group • Concentrated H_2SO_4 group		A2/A7	b2,c2/d2
2	Chemical bonding	6	A2	a2
3	Representative elements (from Gr.1 to gr.7)	6,8	A2	a2

	Practical • Miscellaneous group • Scheme of identification of acidic radical • Investigation for Basic Radical in sample salts group Dil. HCl • Dil. HCl + H_2S group • NH_4OH + NH_4Cl group • NH4OH + NH4Cl + H2S group		A2/A7	b2,c2/d2
4	Nobel gases, Lanthanides and Actinides	6	A2	a2
	Practical □NH_4OH + NH_4Cl + $(NH_4)_2$ CO_3 group Scheme of identification of basic		A2/A7	b2,c2/d2

Course Coordinator: Asso. Prof. Dr. Ramadan El kateb
Head of Department: Asso. Prof. Dr. Hend Gadow
Date of Approval: 2023

Mathematics4
(BAS121)

1-Basic Information:

Program Title	Chemical Engineering Program
Department Offering the Program	Chemical EngineeringDepartment
Department Responsible for the Course	Basic Science and Engineering Department
Course Title	Mathematics 4
Course Code	BAS121
Year/Level	Level: 1
Specialization	Major
Authorization Date of Course Specification	-

Teaching hours	**Lectures**	**Exercise**	**laboratory**	**Student's load**
	2	2	-	5

2-Course Aims:

No.	**Aims**
1	Master a broad range of fundamental Mathematical engineering knowledge and specialized skills of Complex Analysis and Special functions, as well as the ability to apply acquired knowledge of Complex Analysis and Special functions in real-world situations as Heat equation and Wave equation by applying theories and abstract thinking in analytic critical and systemic thinking to identify, diagnose, and solve mathematical engineering problems as by using complex series and Fourier series .

3-Competencies:

Competencies	**Learning Outcomes (LO'S)**

A1. Identify, formulate, and solve complex engineering problems by applying engineering fundamentals, basic science and mathematics.	a1. Learn the general principles of differential equations and series and it's applications in mathematical engineering. a2. Describe the effect of mathematical engineering principles and theories that apply in the most fundamental problems. a3. Define the basic concepts of series and analytic functions. b1. Use the basics of Complex Analysis and Special functions to solve engineering problems. c1. Apply the methods of solving partial differential equations to generate solutions for heating and wave equations.

4. Course Contents:

No.	Topics	Lecture	laboratory	Exercise	Student's load
1	**Special functions**	4	**-**	**4**	10
2	**Fourier series periodic functions and Euler's laws**	**4**	**-**	**4**	**10**
3	**Fourier's integrations – solutions of the differential**	**4**	**-**	**4**	**10**
4	**equations by series - solving the partial differential equations using variables separation**	4	**-**	**4**	**10**
5	**Functions with complex variables – complex quantities algebra multiple values functions - the analytical functions and Koshi's theorem**	**4**	**-**	**4**	**10**

6	**- the complex series**	**4**	**-**	**4**	**10**
7	**Taylor and Lorant series - the zeros, unique points and the rest - the infinite series.**	**4**	**-**	**4**	**10**
Total		**28**	**-**	**28**	**70**

5. Teaching and learning methods:

No	Topics	Face-to-Face Lecture	Online Lecture	Flipped Classroom	Presentation and movies	Discussion	Problem solving	Brain storming	Projects	Site visits	Self-learning and Research	Cooperative	Discovering	Modeling	lab
1	**Special functions**	x	x			x	x	x							
2	**Fourier series periodic functions and Euler's laws**	x	x			x	x	x							
3	**Fourier's integrations – solutions of the differential**	x	x			x	x	x							
4	**equations by series - solving the par+tial differential equations**	x	x			x	x	x							

	using variables separation														
5	**Functions with complex variables – complex quantities algebra + multiple values functions - the analytical functions and Koshi's theorem**	**x**	**x**			**x**	**x**	**x**							
6	**- the complex series**	**x**	**x**			**x**	**x**	**x**							
7	**Taylor and Lorant series - the zeros, unique points and the rest - the infinite series.**	**x**	**x**			**x**	**x**	**x**							

6. Teaching and learning methods for disable students:

No.	Teaching Methods	Reason
1	Presentation of the course in digital material	Better access any time
2	Wed communication with students	Better communication with certain cases
3	Asking small groups to do assignments; each composed of low ,medium and high performance students	Knowledge and skills transfer among different levels of students

7. Student Evaluation:

7.1 Student Evaluation method:

No.	Evaluation Method	Competencies	LO's
1	Periodic exams	A1	a1,a2,a3,b1
2	Semester work(quizzes, sheets, report)	A1	a1,c1
3	Final term examination	A1	b1,a3,c1

7.2 Evaluation Schedule:

No.	Evaluation Method	Weeks
1	Periodic exams	8_{th}
2	Student load	2_{nd} -7_{th} -14_{th}
3	Final term examination	15^{th}

7.3 weighting of Evaluation:

No.	Evaluation Method	Marks
1	Periodic exams	30
2	Student load	30
3	Final term examination	90
Total		**150**

8. List of References:

No.	Reference List
1	Brett Borden and James Luscombe "Fourier series and integrals" Morgan & Claypool Publishers (2017).
2	Chris McMullen "Essential Calculus Skills Practice Workbook with Full Solutions" Zishka Publishing (2018).

9. Facilities required for teaching and learning:

Facility	
1	Lecture classroom
2	Seminar
3	White board

4	Data Show system

10. Matrix of Competencies and LO's of the course:

No.	Topic	Aims	Competencies	LO's
1	**Special functions**	**1**	**A1**	**a1,b1**
2	**Fourier series** **periodic functions and Euler's laws**	**1**	**A1**	**a1,a2, a3**
3	**Fourier's integrations – solutions of the differential**	**1**	**A1**	**c1**
4	**equations by series - solving the partial differential equations using variables separation**	**1**	**A1**	**c1**
5	**Functions with complex variables – complex quantities algebra** **multiple values functions - the analytical functions and Koshi's theorem**	**1**	**A1**	**b1**
6	**- the complex series**	**1**	**A1**	**b1**
7	**Taylor and Lorant series - the zeros, unique points and the rest - the infinite series.**	**1**	**A1**	**a3**

Course Coordinator: Dr .Samar Madin

Head of Department: Ass.prof. Amal bahiry

Date of Approval: 2023

Technical Report Writing
(BAS122)

1- Basic Information:

Program Title	Chemical Engineering Program
Department Offering the Program	Chemical EngineeringDepartment
Department Responsible for the Course	Basic Science and Engineering Department
Course Title	Technical Report Writing
Course Code	BAS122
Year/Level	Level 1
Specialization	Major
Authorization Date of Course Specification	-

Teaching hours	Lectures	Exercise	laboratory	Student's load
	2	-	2	4

2- Course Aims:

No.	Aims
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.

3-Competencies:

Competencies	Learning Outcomes (LO'S)

A5. Practice research techniques and methods of investigation as an inherent part of learning.	a1. Define technical language and report writing. a2.Write technical language and technical report writing through sequence steps (identify report section, present your report, cite reference and add figures and tables). b1. Assess different ideas, views, and knowledge from a range of sources. b2. Evaluate results of report models by analyzing percentage of plagiarism and rules of scientific report and rules of presentation. c1. Prepare technical reports d1. Search for information to engage in lifelong selflearning discipline.
A8. Communicate effectively – graphically, verbally and in writing – with a range of audiences using contemporary tools.	d1. Communicate effectively. d2.Demonstrate efficient IT capabilities.

4. Course Contents:

No.	Topics	Lecture	Exercise	laboratory	Student load
1	Introduction to technical writing. ❖ Define a report, Types of reports, Aim ❖ Common concepts: clarity of Writing, Consistency ❖ Supporting Material Language rules (voice, tense) and Style	4	-	-	8
2	Common components of a technical report ❖Organization of report sections Sections function and content	4	-	-	8

3	How to write a technical report ❖ Identify layout, Determine Audience ❖ Assign reference, add non text component ❖ Mechanics of report writing. Quantitative Writing	4	-	-	8
4	Equations, Tables and Figures	2	-	-	4
5	Literature citations	2	-	-	4
6	Using word processing for Writing Report	2	-	8	4
7	Creating slides with presentation graphics programs	2	-	4	4
8	MS Excel Application and power view report command	4	-	8	8
9	Database Report using MS SQL	4	-	8	8
Total		**28**	**-**	**28**	**56**

5. Teaching and learning methods:

No	Topics	Face-to-Face Lecture	Online Lecture	Flipped Classroom	Presentation and movies	Discussion	Problem solving	Brain storming	Projects	Site visits	Self-learning and Research	Cooperative	Discovering	Modeling	lab

1	Introduction to technical writing. ❖ Define a report, Types of reports, Aim ❖Common concepts: clarity of Writing, Consistency ❖ Supporting Material ❖ Language rules (voice, tense) and Style	x	**x**		**x**	**x**									
2	Common components of a technical report ❖ Organization of report sections ❖ Sections function and content	x	**x**		**x**	**x**									
3	How to write a technical report ❖ Identify layout, Determine Audience ❖ Assign reference, add non text component ❖ Mechanics of report writing. ❖ Quantitative Writing	x	**x**			**x**									
4	Equations, Tables and Figures	**x**	**x**			**x**									
5	Literature citations	**x**	**x**			**x**									
6	Using word processing for Writing Report	**x**	**x**			**x**									
7	Creating slides with presentation graphics programs	**x**	**x**			**x**									

8	MS Excel Application and power view report command	x	x			x									
9	Database Report using MS SQL	x	x			x									

6. Teaching and learning methods for disable students:

No.	Teaching Methods	Reason
1	Presentation of the course in digital material	Better access any time
2	Web communication with students	Better communication with certain cases
3	Asking small groups to do assignments; each composed of low, medium and high performance students.	Knowledge and skills transfer among different levels of students

7. Student Evaluation:

7.1 Student Evaluation method:

No.	Evaluation Method	Competencies	LO's
1	Periodic exams	A5	a1,a2
2	Semester work(quizzes, sheets, report, presentation)	A5/A8	c1,d1/d2
3	Practical Examination	A5/A8	c1/d1,d2
4	Final term examination	A5	b1,b2,a1

7.2 Evaluation Schedule:

No.	Evaluation Method	Weeks
1	Periodic exams	8th
2	Student load	2nd ,7th,9th,13th
3	Practical Examination	14th
4	Final term examination	15th

7.3 weighting of Evaluation:

No.	Evaluation method	Marks

1	Periodic exams	20
2	final examination	50
3	Practical	10
4	Student load	20
Total		**100**

8. List of References:

No.	Reference List
1	Gerald J. Alred, Walter E. Oliu, Charles T. Brusaw "The Handbook of Technical Writing" Bedford; 12th Ed, (2020).

9. Facilities required for teaching and learning:

No.	Facility
1	Lecture classroom
2	Presenter
3	Computer lab.
4	White board
5	Data show system
6	Wireless internet
7	Sound system

10. Matrix of Competencies and LO's of the course:

No	Topic	Aims	Competencies	LO's
1	Introduction to technical writing	5	A5	a1
2	Common components of a technical report	5	A5	a2
3	How to write a technical report	5	A5	c1

4	Equations, Tables and Figures	5	A5	a2
5	Literature citations	5	A5	b1
6	Using word processing for Writing Report	5	A5	b2
7	Creating slides with presentation graphics programs	5	A8	d1,d2
8	MS Excel Application and power view report command	5	A8	d1,d2
9	Database Report using MS SQL	5	A5	b2

Course Coordinator: Dr / Mohamed albendary
Head of Department: Ass.prof. Amal bahiry

Date of Approval: 2023

Introductions to Information Technology

(BAS123)

1- Basic Information:

Program Title	Chemical Engineering Program
Department Offering the Program	Chemical EngineeringDepartment
Department Responsible for the Course	Basic Science and Engineering Department
Course Title	Introductions to Information Technology
Course Code	BAS123
Year/Level	Level 1
Specialization	Major
Authorization Date of Course Specification	-

Teaching hours	**Lectures**	**Exercise**	**laboratory**	**Student's load**
	2	2	-	4

2- Course Aims:

No.	Aims
4	Use the techniques, skills, and appropriate engineering tools, necessary for engineering practice web design project and building networks.

3-Competencies:

Competencies	Learning Outcomes (LO’S)
A4.Utilize contemporary technologies, codes of practice and standards, quality guidelines, health and safety requirements, environmental issues and risk management principles.	a2. List the engineering-related business and management principles. a3. Define contemporary engineering technologies and their applications in relation to engineering field & applications c3. Utilize modern technologies related by different engineering fields
A8. Communicate effectively – graphically, verbally and in writing – with a range of audiences using contemporary tools.	d1. Communicate effectively. d2. Demonstrate efficient IT capabilities.

4. Course Contents:

No.	Topics	Lecture	Exercise	laboratory	Student load

1	Introduction to information systems	4	4	-	8
2	Software and hardware used in information systems	6	6	-	12
3	Communication and Networks	4	4	-	8
4	Computer Networking	6	6	-	12
5	The internet; the foundations, Resources and uses of the internet, Emphasizing practical skills for finding, Reading and authorizing materials	4	4	-	8
6	Privacy Security and Ethics	4	4	-	4
7	Web Design using HTML Language and applications	-	-	-	4
Total		**28**	**28**	**-**	**56**

5. Teaching and learning methods:

No	Topics	Face-to-Face Lecture	Online Lecture	Flipped Classroom	Presentation and movies	Discussion	Problem solving	Brain storming	Projects	Site visits	Self-learning and Research	Cooperative	Discovering	Modeling	lab
1	Introduction to information systems	x	x			x									
2	Software and hardware used in information systems	x	x			x									
3	Communication and Networks	x	x			x									
4	Computer Networking	x	x			x									

5	The internet; the foundations, Resources and uses of the internet, Emphasizing practical skills for finding, Reading and authorizing materials	**x**	**x**			**x**									
6	Privacy Security and Ethics	**x**	**x**			**x**									
7	Web Design using HTML Language and applications	**x**	**x**			**x**									

6. Teaching and learning methods for disable students:

No.	Teaching Methods	Reason
1	Presentation of the course in digital material	Better access any time
2	Web communication with students	Better communication with certain cases
3	Asking small groups to do assignments; each composed of low, medium and high performance students.	Knowledge and skills transfer among different levels of students

7. Student Evaluation:

7.1 Student Evaluation methods:

No.	Evaluation Method	Competencies	LO's
1	Periodic exams	A4	a2,a3,c3
2	Semester work(quizzes, sheets, report)	A8/A4	d1,d2/c3
3	Practical Examination	A8/A4	d1,d2/c3
4	Final term examination	A4	c3,a3,a2

7.2 Evaluation Schedule:

No.	Evaluation Method	Weeks
1	Periodic exams	8th
2	Student load	2nd ,7th,9th,13th
3	Practical Examination	14th

4	Final term examination	15th

7.3 weighting of Evaluation:

No.	Evaluation Method	Marks
1	Periodic exams	20
2	final examination	50
3	Practical examination	10
4	Student load	20
Total		**100**

8. List of References:

No.	Reference List
1	Computing essentials timothy, O' leary and linda ,2014 .

9. Facilities required for teaching and learning:

No.	Facility
1	Lecture classroom
2	Presenter
3	Computer lab.
4	White board
5	Data show system
6	Wireless internet
7	Sound system

10. Matrix of Competencies and LO’s of the course:

No.	Topic	Aims	Competencies	LO’s
1	Introduction to information systems	4	A4	a2
2	Software and hardware used in information systems	4	A4	a2
3	Communication and Networks	4	A4	c3,a3
4	Computer Networking	4	A4	c3,a3
5	The internet;	4	A4	c3,a3
6	Privacy Security and Ethics	4	A4	c3,a3
7	Web Design using HTML Language and applications	4	A8	d1,d2

Course Coordinator: Dr. Amira Elsonbaty

Head of Department: Ass.prof. Amal bahiry

Date of Approval: 2023

Strength of Materials

(BAS124**)**

1-Basic Information:

Program Title	Chemical Engineering Program
Department Offering the Program	Chemical EngineeringDepartment
Department Responsible for the Course	Basic Science and Engineering Department
Course Title	Strength of Materials
Course Code	BAS124
Year/Level	level 1
Specialization	Major
Authorization Date of Course Specification	-

Teaching hours	**Lectures**	**Exercise**	**laboratory**	**Student's load**
	2	2	-	4

2-Course Aims:

No.	**Aims**
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- Competencies:

Competencies	**Learning Outcomes (LO'S)**

A1. Identify, formulate, and solve complex engineering problems by applying engineering fundamentals, basic science and mathematics.	a1.Define the concepts and theories of mathematics, necessary for engineering system analysis, general concepts of strength of material, normal stress, direct shear stress, mohr`s cycle. b1. Use math ideas and theories that are applicable to solutions for engineering problems and system design, normal stress, direct shear, stresses in beams, torsional stresses. c2. Practice the neatness and aesthetics in design to approach stresses in beams, torsional stresses, and pressure vessels c3.Apply engineering knowledge and understanding to improve design, products and/or services, normal stress, direct shear stress, stresses in beams, torsional stresses, pressure vessels,mohr`s cycle.

4. Course Contents:

No.	Topics	Lecture	Exercise	laboratory	Student load
1	Simple states of stress and strain	2	2	-	4
2	Tension and compression stress	4	4	-	8
3	Shear stress in bolts	4	4	-	8
4	Bending and shearing stresses in beams	4	4	-	8
5	Torsion stresses	2	2	-	4
6	Deflection of Beams	4	4	-	8
7	Analysis of thin-walled pressure vessels	4	4	-	8
8	Analysis of plane stress	4	4	-	8
Total		**28**	**28**	**-**	**56**

5. Teaching and learning methods:

No	Topics	Face-to-Face Lecture	Online Lecture	Flipped Classroom	Presentation and movies	Discussion	Problem solving	Brain storming	Projects	Site visits	Self-learning and Research	Cooperative	Discovering	Modeling	lab
1	Simple states of stress and strain	x	x			x									
2	Tension and compression stress	x	x			x									
3	Shear stress in bolts	x	x			x	x								
4	Bending and shearing stresses in beams	x	x			x	x								
5	Torsion stresses	x	x			x	x								
6	Deflection of Beams	x	x			x	x								
7	Analysis of thin-walled pressure vessels	x	x			x	x								
8	Analysis of plane stress	x	x			x	x								

6. Teaching and learning methods for disable students:

No	Teaching Methods	Reason
1	Presentation of the course in digital material	Better access any time
2	Asking small groups to do assignments; each composed of low, medium, and high performance students.	Knowledge and skills transfer among different level of students.

7. Student evaluation:

7.1 Student evaluation method:

No.	Evaluation Method	Competencies	LO's
1	Periodic exams	A1	a1,b1
2	Semester work(quizzes, sheets, report)	A1	c2,c3
3	Final term examination	A1	a1,b1

7.2 Evaluation Schedule:

No.	Evaluation Method	Weeks
1	Student load	2_{nd}, 7_{th} , 9_{th}
2	Periodic exams	8_{th}
3	Final term examination	15_{th}

7.3 weighting of Evaluation:

No.	Evaluation Method	Marks
1	Periodic exams	20
2	Student load	20
3	Final-term examination	60
	Total	**100**

8. List of References:

No.	Reference list
1	T. D. Gunneswara Rao and Mudimby Andal " Strength of Materials: Fundamentals and Applications, 2018
2	Akira Todoroki " Fundamentals of Mechanics of Materials: Part 1 Stress, Strain, Torsion" 2017.

9. Facilities required for teaching and learning:

No.	Facility
1	Lecture classroom
2	seminar
3	White board

4	Data Show system

10. Matrix of Competencies and LO’s of the course:

No.	Topic	Aims	Competencies	LO’s
1	Simple states of stress and strain	2	A1	a1, b1
2	Tension and compression stress	2	A1	a1, b1
3	Shear stress in bolts	2	A1	a1, b1
4	Bending and shearing stresses in beams	2	A1	a1, b1
5	Torsion stresses	2	A1	a1, b1
6	Deflection of Beams	2	A1	c3
7	Analysis of thin-walled pressure vessels	2	A1	c2,c3
8	Analysis of plane stress	2	A1	c2,c3

Course Coordinator: Dr. A. E. Kabeel
Head of Department: Ass.prof. Amal bahiry
Date of Approval: 2023

Organic Chemistry

CHE121

1-Basic Information:

Program Title	Chemical Engineering Program
Department Offering the Program	Chemical Engineering Department
Department Responsible for the Course	Chemical Engineering Department
Course Title	Organic Chemistry
Course Code	CHE121
Year/Level	Level 1
Specialization	Major
Authorization Date of Course Specification	-

Teaching hours	Lectures	Exercise	laboratory	Student's load
	2	-	2	5

2-Course Aims:

No.	Aims
1	Master a broad range of organic chemistry engineering knowledge and specialized skills, as well as the ability to apply acquired knowledge in real-world situations by applying theories in organic critical and systemic thinking to identify, diagnose, and solve engineering problems of varying complexity and variation.
8	Consider the impact of bioorganic chemical process industries on society, economics, and the environment using fundamental knowledge of chemical process industries.

3-Competencies:

Competencies	Learning Outcomes (LO'S)
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.

	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.
A6. Plan, supervise and monitor implementation of engineering projects, taking into consideration other trades requirements.	b1. Interpret data derived from laboratory observation from equipment flow sheets, charts and curves to interpret data derived from laboratory observation.
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.
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 organic chemical reactions that utilize a full range of thermodynamics and kinetics of chemical reactions. b1. Design new processes or products through utilization organic chemical reactions. c1. Apply the practical organic chemistry to identify the different classes of organic chemistry.

4. Course Contents:

No.	Topics	Lecture	Exercise	laboratory	Student load
1	Organic Chemistry: basic concepts	2	-	**2**	**5**
2	alkanes	2	-	2	**5**
3	Stereochemistry	4	-	4	**10**
4	Alkenes	4	-	4	**10**
5	Alkynes	2	-	2	**5**
6	Aromatic Compounds	4	-	4	**10**
7	Alcohols	2	-	**2**	**5**
8	Ethers and alkyl halide	2	-	**2**	**5**
9	Aldehydes and Ketones	2	-	**2**	**5**

10	Carboxylic Acids and Their Derivatives	2	-	**2**	**5**
11	Amines and polyfunctional compounds	2	-	**2**	**5**
Total		**28**	**-**	**28**	**70**

5. Teaching and learning methods:

No	**Topics**	**Face-to-Face Lecture**	**Online Lecture**	**Flipped Classroom**	**Presentation and movies**	**Discussion**	**Problem solving**	**Brain storming**	**Projects**	**Site visits**	**Self-learning and Research**	**Cooperative**	**Discovering**	**Modeling**	**lab**
1	Organic Chemistry: basic concepts	**x**	**x**			**x**					**x**				
2	alkanes	**x**	**x**			**x**									
3	Stereochemistry	**x**	**x**			**x**	**x**				**x**				
4	Alkenes	**x**	**x**			**x**	**x**								
5	Alkynes	**x**	**x**			**x**					**x**				
6	Aromatic Compounds	**x**	**x**			**x**	**x**								
7	Alcohols	**x**	**x**			**x**	**x**								
8	Ethers and alkyl halide	**x**	**x**			**x**	**x**				**x**				
9	Aldehydes and Ketones	**x**	**x**			**x**	**x**				**x**				

10	Carboxylic Acids and Their Derivatives	x	x			x	x								
11	Amines and polyfunctional compounds	x	x			x					x				

6. Teaching and learning methods for disable students:

No.	Teaching Methods	Reason
1	Presentation of the course in digital material	Better access any time
2	Web communication with students	Better communication with certain cases
3	Asking small groups to do assignments; each composed of low ,medium and high performance students	Knowledge and skills transfer among different levels of students

7. Student evaluation:

7.1 Student evaluation method:

No.	Evaluation Method	Competencies	LO's
1	Periodic exams	B1/A7	a1, b1/ d1,d2
2	Semester work (sheets, quizzes)	A7	d3
3	Final term examination	A1/B1	a2/a1,b1
4	Practical Examination	A2/A6	a1, b1/b1

7.2 Evaluation Schedule:

No.	Evaluation Method	Weeks
1	Periodic exams	Any week
2	Student load	Any week
3	Practical Examination	14^{th}
4	Final term examination	15^{th}

7.3 weighting of Evaluation:

No.	Evaluation method	Marks
1	Periodic exams	30

2	Student load	30
3	Practical Examination	15
4	Final term examination	75
Total		**150**

8. List of References:

No.	Reference List
1	Dean Appling,Spencer Anthony-Cahill,Christopher Mathews"Biochemistry: Concepts and Connections" Pearson; 2nd edition (2018)
2	Victor W. Rodwell, David A. Bender, Kathleen M. Botham, Peter J. Kennelly, P. Anthony Weil "Harper's Illustrated Biochemistry, 31e, (2018)

9. Facilities required for teaching and learning:

No.	Facility	N	Facility
1	Lecture classroom	6**o.**	Sound system
2	Presenter	57	Wireless internet
3	White board		
4	Data show system		
5	Lab		

10. Matrix of Competencies and LO's of the course:

No.	Topic	Aims	Competencies	LO's
1	Organic Chemistry: basic concepts Practical Identification of hydrocarbons	1 and 8	A2, B1	(a1,b1),(a1,b1,c1)
2	Alkanes Practical Identification of alcohols	1 and 8	A2,A6,A7,and B1	(a1,b1),(b1),(d1,d2,d3) and (a1)
3	Stereochemistry Practical Identification of phenols	1 and 8	A2,A6,A7,and B1	(a1,b1),(b1),(d1,d2,d3) and (b1)
4	Alkenes Practical	1 and 8	A2,A6,A7,and B1	(a1,b1,c1),(b1),(d1,d2,d3) and (c1)

	Identification of aldehydes and ketones			
5	Alkynes Practical Identification ofaliphatic	1 and 8	A2,A6,A7,and B1	(a1,b1,c1),(b1),(d1,d2,d3) and (c1)
6	Aromatic Compounds	1 and 8	A2,A6,A7,and B1	(a1,b1,c1),(b1),(d1,d2,d3) and (c1)
	Practical Identification ofaromatic			
7	Alcohols Practical Identification ofsaltof carboxylic acids	1 and 8	A2,A6,A7,and B1	(b1,c1),(b1),(d1,d2) and (c1)
8	Ethers	1 and 8	A2,A6,A7,and B1	(a1, c1),(b1),(d1, d3) and (c1)
	Practical Identification ofamines			
9	Aldehydes and Ketones	1 and 8	A2,A6,A7,and B1	(a1,b1,c1),(b1),(d1,d2,d3) and (a1)
	Practical Identification ofcarbohydrates			
10	Carboxylic Acids and Their Derivatives Practical Scheme for identification of unknown organic compounds	1 and 8	A2,A6,A7,and B1	(a1,b1,c1),(b1),(d1,d2,d3) and (c1)
11	Amines and Poly functional compounds Practical Revision	1 and 8	A2,A6,A7,and B1	(a1,b1,c1),(b1),(d1,d2,d3) and (b1)

Course Coordinator: Asso.prof. Khaled Samir
Head of Department: Asso.prof. Hend Elsayed Gadow
Date of Approval: 2023

Physical Chemistry
CHE122

1-Basic Information:

Program Title	Chemical Engineering Program
Department Offering the Program	Chemical Engineering Department
Department Responsible for the Course	Chemical Engineering Department
Course Title	Physical Chemistry
Course Code	CHE122
Year/Level	Level 1
Specialization	Major
Authorization Date of Course Specification	-

Teaching hours	Lectures	Exercise	laboratory	Student's load
	2	-	2	3

2-Course Aims:

No.	Aims
1	Apply acquired knowledge of physical chemistry in real-world situations by applying theories in analytic critical and systemic thinking to identify, diagnose, and solve engineering problems of varying complexity and variation.
6	Analyze data from the physical chemistry experiments to manage resources creatively.

3-Competencies:

Competencies	Learning Outcomes (LO'S)
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 physical chemistry including chemical reaction equilibrium, chemical kinetic reactions and thermodynamics. b1. Summarize the appropriate techniques relevant to physical chemistry
A5. Practice research techniques and methods of investigation as an inherent part of learning.	a1. Define technical language and report writing. 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.	b1. Interpret data derived from laboratory observation from equipment flow sheets, charts and curves to interpret data derived from laboratory observation.
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.

4. Course Contents:

No.	Topics	Lecture	Exercise	laboratory	Student load
1	Gases (Ideal gas, real gas)	4	-	-	6
2	Solutions (true and colloidal solutions) Practical The nature of Copper – Ammonia Complex in aqueous Solution	4	-	4	6
3	Chemical kinetics (Rate of reaction) Practical • Study of Homogeneous Catalytic Decomposition of H_2O_2 by Initial Rate Method • Catalytic decomposition H_2O_2 • Determination of The order of the reaction between H_2O_2 and HI	10	-	20	15
4	Chemical equilibrium	4	-	-	6
5	Surface chemistry (Adsorption) Practical Adsorption of Oxalic Acid on Charcoal	4	-	4	6
6	Chemical thermodynamic	2	-	-	3
Total		**28**	**-**	**28**	**42**

5. Teaching and learning methods:

No	Topics	Face-to-Face Lecture	Online Lecture	Flipped Classroom	Presentation and movies	Discussion	Problem solving	Brain storming	Projects	Site visits	Self-learning and Research	Cooperative	Discovering	Modeling	lab
1	Gases (Ideal gas, real gas)	x	x								x				
2	Solutions (true and colloidal solutions) Practical - The nature of Copper – Ammonia Complex in aqueous Solution	x	x												x

3	Chemical kinetics (Rate of reaction) Practical • Study of Homogeneous Catalytic Decomposition of H_2O_2 by Initial Rate Method • Catalytic decomposition H_2O_2 • Determination of The order of the reaction between H_2O_2 and HI	x	x			x									x
4	Chemical equilibrium														
5	Surface chemistry (Adsorption) Practical Adsorption of Oxalic Acid on Charcoal	x	x												x
6	Chemical thermodynamic	x	x			x									

6. Teaching and learning methods for disable students:

No.	Teaching Methods	Reason
1	Presentation of the course in digital material	Better access any time
2	Web communication with students	Better communication with
3	Asking small groups to do assignments; each composed of low ,medium and high performance students	Knowledge and skills transfer among different levels of students

7. Student evaluation:

7.1 Student evaluation method:

No.	Evaluation Method	Competencies	LO's
1	Periodic exams	B1	a1,b1
2	Semester work (sheets ,quizs , presentation)	A5/A7	a1,c1/d2
3	Practical Examination	A6	b1
4	Final term examination	A5/B1	a1,c1/ a1, b1

7.2 Evaluation Schedule:

No.	Evaluation Method	Weeks
1	Periodic exams	8^{th}
2	Student load	2^{nd} -7^{th} - 9^{th}
3	Practical Examination	14^{th}
4	Final term examination	15^{th}

7.3 weighting of Evaluation:

No.	Evaluation method	Marks
1	Periodic exams	30
2	Student load	30
3	Practical Examination	15
4	Final term examination	75
Total		**150**

8. List of References:

No.	Reference List
1	Atkins, P. W., Physical Chemistry, Oxford University Press, 11th. Ed., 2018.
2	Jamie Langdon "Physical Chemistry: Theories, Models and Applications" NY RESEARCH PRESS; (2018).
3	Andreas Hofmann "Physical Chemistry Essentials" Springer; 1st edition, (2018).

9. Facilities required for teaching and learning:

No.	Facility	No.	Facility
1	Lecture classroom	5	Data show system
2	Presenter	6	Sound system
3	White board		
4	Lab		

10. Matrix of Competencies and LO's of the course:

No.	Topic	Aims	Competencies	LO's
1	Gases (Ideal gas, real gas)	1	A5,A7	(a1,d1),(d1,d2,d3)
2	Solutions (true and colloidal solutions) Practical ·The nature of Copper – Ammonia Complex in aqueous Solution	1,6	A5,A6,A7	(a1,c1,d1),(b1)(d1,d2,d3)
3	Chemical kinetics (Rate of reaction) Practical • Study of Homogeneous Catalytic Decomposition of H_2O_2 by Initial Rate Method • Catalytic decomposition H_2O_2 • Determination of The order of the reaction between H_2O_2 and HI	6	A5,A7,B1	(c1),(d1),a1,b1
4	Chemical equilibrium	6	B1	a1
5	Surface chemistry (Adsorption) Practical ·Adsorption of Oxalic Acid on Charcoal	6	A5,A7,B1	(c1),(d1),a1,b1
6	Chemical thermodynamic	1,6	B1	a1,b1

Course Coordinator: Dr. Mohamed fakeeh
Head of Department: Asso.prof. Hend Elsayed Gadow
Date of Approval: 2023

Engineering Probability and Statistics

(BAS211)

1- Basic Information:

Program Title	Chemical Engineering Program
Department Offering the Program	Chemical EngineeringDepartment
Department Responsible for the Course	Basic Science and Engineering Department
Course Title	Engineering Probability and Statistics
Course Code	BAS211
Year/Level	Level: 2
Specialization	Major
Authorization Date of Course Specification	-

Teaching hours	**Lectures**	**Exercise**	**laboratory**	**Student's load**
	2	2	-	4

2- Course Aims:

No.	**Aims**
1	The ability to apply probability theories and hypothesis testing in analytic critical and systemic thinking to solve engineering problems of varying complexity and variation.
6	Analyze data from the intended tests to manage resources creatively

3-Competencies :

Competencies	**Learning Outcomes (LO'S)**
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.** **b1. Use math ideas and theories that are applicable to the field.** **b3. Applying engineering basics that are relevant to the subject.**

	c2. Identify, formulate, and solve complex engineering problems by applying the concepts and the theories of sciences, appropriate to the discipline.

4. Course Contents:

No.	Topics	Lecture	laboratory	Exercise	Student's load
1	**Probability theory**	4	**-**	**4**	8
2	**Discrete and continuous probability distributions**	**4**	**-**	**4**	8
3	**Statistics in engineering**	**4**	**-**	**4**	8
4	**Descriptive Statistics Sampling distributions**	4	**-**	**4**	8
5	**Estimation and confidence intervals**	**4**	**-**	**4**	**8**
6	**Hypothesis testing**	**4**	**-**	**4**	**8**
7	**Simple regression**	**4**	**-**	**4**	**8**
Total		**28**	**-**	**28**	**56**

5. Teaching and learning methods:

No	Topics	Face-to-Face Lecture	Online Lecture	Flipped Classroom	Presentation and movies	Discussion	Problem solving	Brain storming	Projects	Site visits	Self-learning and Research	Cooperative	Discovering	Modeling	lab
1	Probability theory	x	X			x	x	x							
2	Discrete and continuous probability distributions	x	X			x	x	x							
3	Statistics in engineering	x	X			x	x	x							
4	Descriptive Statistics Sampling distributions	x	X			x	x	x							
5	Estimation and confidence intervals	x	X			x	x	x							
6	Hypothesis testing	x	X			x	x	x							
7	Simple regression	x	X			x	x	x							

6. Teaching and learning methods for disable students:

No.	Teaching Methods	Reason
1	Presentation of the course in digital material	Better access any time

2	Wed communication with students	Better communication with certain cases
3	Asking small groups to do assignments; each composed of low ,medium and high performance students	Knowledge and skills transfer among different levels of students

7. Student Evaluation:

7.1 Student Evaluation method:

No.	Evaluation Method	Competencies	LO's
1	**Periodic Exam**	**C1**	**a1, a2, b3**
2	**Semester work (quizzes, sheets, report)**	**C1**	**a1, c2**
3	**Final exam**	**C1**	**a2, b1, b3**

7.2 Evaluation Schedule:

No.	Evaluation Method	Weeks
1	Periodic exams	8th
2	Student load	2nd -7th - 9th -14th
3	Final term examination	15th

7.3 weighting of Evaluation:

No.	Evaluation Method	Marks
1	Periodic exams	20
2	Student load	20
3	Final term examination	60
Total		**100**

8. List of References:

No.	Reference List
1	Hartmut Schiefer, Felix Schiefer "Statistics for Engineers" Springer; 1st edition, (2021).

2	Andrew Metcalfe, David Green,Tony Greenfield,Mayhayaudin Mansor,Andrew Smith,Jonathan Tuke"Statistics in Engineering With Examples in MATLAB" 2nd Edition, Chapman and Hall/CRC (2019).

9. Facilities required for teaching and learning:

No.	Facility
1	Lecture classroom
2	Presenter
3	White board
4	Data show system
5	Sound system

10. Matrix of Competencies and LO's of the course:

No.	Topic	Aims	Competencies	LO's
1	**Probability theory**	**1**	**C1**	**a1**
2	**Discrete and continuous probability distributions**	**6**	**C1**	**a2**
3	**Statistics in engineering**	**1**	**C1**	**b3**
4	**Descriptive Statistics Sampling distributions**	**1**	**C1**	**b1**
5	**Estimation and confidence intervals**	**1**	**C1**	**c2**
6	**Hypothesis testing**	**6**	**C1**	**c2**
7	**Simple regression**	**6**	**C1**	**c2**

Course Coordinator: Dr. Samar Madin

Head of Department: Ass.prof. Amal bahiry

Date of Approval: 2023

Fluid Mechanics
(BAS212)

1-Basic Information:

Program Title	Chemical Engineering Program
Department Offering the Program	Chemical EngineeringDepartment
Department Responsible for the Course	Basic Science and Engineering Department
Course Title	Fluid Mechanics
Course Code	BAS212
Year/Level	level 2
Specialization	Major
Authorization Date of Course Specification	-

Teaching hours	**Lectures**	**Exercise**	**laboratory**	**Student's load**
	2	1	1	4

2- Course Aims:

No.	Aims
1	Master a broad range of Fluid Mechanics knowledge and specialized skills, as well as the ability to understand and apply physical concept knowledge in real-world situations by applying fluid mechanics basic theories. Also, to Apply knowledge of science and engineering concepts to study fluid properties, fluid statics and fluid dynamics and to abstract course knowledge that give him or her, the ability to think, identify, diagnose, and solve engineering problems of varying complexity and variation in real world as an engineer.
4	Use the techniques, skills, and current engineering tools required for engineering practice of fluid mechanics 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.
8	Consider the impact of fluid mechanics study in real world, and its strong relation with environment and almost of all the technology fields upgrades.

3- Competencies

Competencies	Learning Outcomes (LO'S)

A1. Identify, formulate, and solve complex engineering problems by applying engineering fundamentals, basic science and mathematics.	a1. Define concepts of energy, momentum equations and dimensional analysis (laminar and turbulent flow). a2. Explain the basic principles of fluid mechanics engineering. b1. Analyze various ideas and views for different forces on immersed bodies. b2. Using scientific concepts and theories that are relevant to the fluid mechanics. b3. Applying engineering basics that are relevant to the subject.
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. Apply knowledge of Bernoulli and continuity equations for experiments of Venturi meter and losses in pipes. a2. Analyze data in laboratory and in pipes and pumps field. b1. Conduct basic experiments to learn about the basic characteristics and features of fluids for statics and dynamics branches.

4. Course Contents:

No.	Topics	Lecture	Exercise	laboratory	Student load
1	Fluid properties, fluid statics, kinematics	2	2	2	6
2	Fluid dynamics including energy and Momentum equations	4	2	2	8
3	Dimensional analysis, Laminar flow, Turbulent flow and its applications	2	2	2	6
4	Forces on immersed bodies, Introduction to compressible flow	4	2	2	8
5	Applications to filtration and fluidization	4	2	2	8
6	Laboratory course in Fluid Mechanics includes experiments on venture-meter, friction losses in pipes	6	2	2	10

7	Center of pressure, Flow measuring apparatus, multi-pump test (Pump characteristics) and losses in piping systems	6	2	2	10
Total		**28**	**14**	**14**	**56**

5. Teaching and learning methods:

No	Topics	Face-to-Face Lecture	Online Lecture	Flipped Classroom	Presentation and movies	Discussion	Problem solving	Brain storming	Projects	Site visits	Self-learning and Research	Cooperative	Discovering	Modeling	lab
1	Fluid properties, fluid statics, kinematics	x	x			x									
2	Fluid dynamics including energy and Momentum equations	x	x			x	x								
3	Dimensional analysis, Laminar flow, Turbulent flow and its applications	x	x			x		x							
4	Forces on immersed bodies, Introduction to compressible flow	x	x			x									
5	Applications to filtration and fluidization	x	x			x					x				

6	Laboratory course in Fluid Mechanics includes experiments on venture-meter, friction losses in pipes	x	x												x
7	Center of pressure, Flow measuring apparatus, multi-pump test (Pump characteristics) and losses in piping systems	x	x			x									

6. Teaching and learning methods for disable students:

No.	Teaching Methods	Reason
1	Presentation of the course in digital material	Better access any time
2	Web communication with students	Better communication with certain cases
3	Asking small groups to do assignments; each composed of low, medium and high performance students.	Knowledge and skills transfer among different levels of students

7. Student Evaluation:

7.1 Student Evaluation method:

No.	Evaluation Method	Competencies	LO's
1	Periodic exams	A1	a1,a2,b1,b2,b3
2	Semester work(quizzes, sheets, report)	A1	a1,b2
3	Final term examination	A1 ,A2	a1,a2,b1,b2,b3

7.2 Evaluation Schedule:

No.	Evaluation Method	Weeks
1	Periodic exams	8th
2	Student load	2nd ,7th,9th,14th
3	Final term examination	15th

7.3 weighting of Evaluation:

No.	Evaluation method	Marks

1	Periodic exams	30
2	final examination	75
3	Practical examination	15
4	Student load	30
	Total	**150**

8. List of References:

No.	Reference List
1	Gerhart, Philip M., Andrew L. Gerhart, and John I. Hochstein. Munson, Young and Okiishi's Fundamentals of Fluid Mechanics. John Wiley & Sons, 2021.
2	CENGEL "FLUID MECHANICS: FUNDAMENTALS AND APPLICATION" MC GRAW HILL INDIA; 4th edition, (2019).
3	Young, D. F., Munson, B. R., Okiishi, T. H., & Huebsch, W. W. (2021). A brief introduction to fluid mechanics. John Wiley & Sons.

9. Facilities required for teaching and learning:

	Facility
1	Lecture classroom
2	Seminar
3	Computer lab.
4	White board
5	Data Show system

10. Matrix of Competencies and LO's of the course:

No.	Topic	Aims	Competencies	LO's
1	Fluid properties, fluid statics, kinematics	1	A1	a1,a2
2	Fluid Dynamics including Energy and Momentum equations	1	A1	a1
3	Dimensional analysis, laminar flow, turbulent flow and its applications	1	A1	a1
4	forces on immersed bodies, introduction to compressible flow	4	A1	b1

5	Applications to filtration and fluidization	8	A1	b2,b3
6	Laboratory course in Fluid Mechanics includes experiments on venture-meter, friction losses in pipes	4,8	A2	a2
7	Center of pressure, flow measuring apparatus, multi-pump test (Pump characteristics) and losses in piping systems	4,8	A2	a1,b1

Course Coordinator: Dr / Motaz Mostafa
Head of Department: Ass.prof. Amal bahiry

Date of Approval: 2023

Engineering Economy

(BAS213)

1-Basic Information:

Program Title	Chemical engineering Program
Department Offering the Program	Chemical engineering Department
Department Responsible for the Course	Basic Science and Engineering Department
Course Title	Engineering Economy
Course Code	BAS213
Year/Level	Level 2
Specialization	Major
Authorization Date of Course Specification	-

Teaching hours	**Lectures**	**Exercise**	**laboratory**	**Student's load**
	2	1	-	3

2-Course Aims:

No.	**Aims**
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-Competencies:

Competencies	**Learning Outcomes (LO'S)**
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. List the economic concepts related to characteristics in engineering analysis to improve the engineering process. a2. Recognize business and management principles relevant to engineering for replacement and depreciation of equipment to reduce the cost of operations. b1. Combine different ideas, views, and knowledge from a range of sources to evaluate the characteristics of project economic c1. Assess economic, societal, and environmental dimensions and risk management in engineering design.

A4. Utilize contemporary technologies, codes of practice and standards, quality guidelines, health and safety requirements, environmental issues and risk management principles.	a2.List the engineering-related economy. b1.Innovate economy methodical approaches when dealing with new and advancing technology. c2Use fundamental economy organizational abilities.

4. Course Contents:

No.	Topics	Lecture	Exercise	laboratory	Student load
1	Basic concepts of engineering economy	4	2	-	6
2	Break even analysis	4	2	-	6
3	Time value of money	6	3	-	9
4	Depreciation and replacement analysis	4	2	-	6
5	Selection between alternatives	6	3	-	9
6	Productivity	4	2	-	6
Total		**28**	**14**	**-**	**42**

5. Teaching and learning methods:

No	Topics	Face-to-Face Lecture	Online Lecture	Flipped Classroom	Presentation and movies	Discussion	Problem solving	Brain storming	Projects	Site visits	Self-learning and Research	Cooperative	Discovering	Modeling	lab
1	Basic concepts of engineering economy	x	x			x									
2	Break even analysis	x	x			x	x								
3	Time value of money	x	x			x		x							
4	Depreciation and replacement analysis	x	x			x	x								

5	Selection between alternatives	x	x			x		x							
6	Productivity	x	x			x	x								

6. Teaching and learning methods for disable students:

No.	Teaching Methods	Reason
1	Presentation of the course in digital material	Better access any time
2	Asking small groups to do assignments; each composed of low, medium, and high performance students.	Knowledge and skills transfer among different level of students.

7. Student evaluation:

7.1 Student evaluation method:

No.	Evaluation Method	Competencies	LO's
1	Periodic exams	A3	a1,a2,b1
2	Semester work(quizzes, sheets, report)	A3	b1,c1
3	Final term examination	A3,A4	a1,b1,c2

7.2 Evaluation Schedule:

No.	Evaluation Method	Weeks
1	Student load	$6_{th}, 11_{th}$
2	Periodic exams	8_{th}
3	Final term examination	15_{th}

7.3 weighting of Evaluation:

No.	Evaluation method	Marks
1	Periodic exams	20
2	Student load	20
3	Final-term examination	60
Total		**100**

8. List of References:

No.	Reference List
1	Don Newnan, Ted Eschenbach, Jerome Lavelle, Neal Lewis "Engineering Economic Analysis" Oxford University Press; 14th edition, (2019).

2	Leland Blank, Anthony Tarquin "Engineering Economy" McGraw Hill; 8th edition, (2017).
3	William Sullivan, Elin Wicks, C Koelling "Engineering Economy" Pearson; 17th edition, (2018).

9. Facilities required for teaching and learning:

No.	Facility
1	Lecture classroom
2	seminar
3	White board
4	Data Show system

10. Matrix of Competencies and LO's of the course:

No.	Topic	Aims	Competencies	LO's
1	Basic concepts of engineering economy	2	A3	a1
2	Break even analysis	2	A3	a1
3	Time value of money	2	A3	a2
4	Depreciation and replacement analysis	2	A4	a2
5	Selection between alternatives	2	A4	b1,c1
6	Productivity	2	A4	c2

Course Coordinator: Dr. Hany Hashish
Head of Department: Ass.prof. Amal bahiry
Date of Approval: 2023

Heritage of Egyptian Literature

BAS214

1-Basic Information:

Program Title	Chemical Engineering Program
Department Offering the Program	Chemical Engineering Department
Department Responsible for the Course	Chemical Engineering Department
Course Title	Heritage of Egyptian Literature
Course Code	BAS214
Year/Level	Level 2
Specialization	Major
Authorization Date of Course Specification	-

Teaching hours	Lectures	Exercise	laboratory	Student's load
	2	-	-	3

2-Course Aims:

No.	Aims
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.

3-Competencies:

Competencies	Learning Outcomes (LO'S)
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. d3. Refer to relevant literatures.

4. Course Contents:

No.	Topics	Lecture	Exercise	laboratory	Student load
1	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.	4	-	-	6

2	مصر وتراثها الأدبي من منظورحضاري وإبداعي - المكتبة التراثية المصرية من منظور تاريخي متجدد - دراسة مفهوم وضعية العصورالوسطى في مصر والفرق بينها وبين العصور	6	-	-	9
	الوسطى في أوروبا - التراث الجغرافي المصري وأدب الرحلة في كتابات مصرية				
3	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	8	-	-	12
4	- مجالات الإبداع في الشعر المصري)الطبيعة المصرية - أدب الحروب الموضوعات الجديدة والبيئة المصرية(- مدارس الكتابة الفنية على المستوى الرسمي وغيرها	6	-	-	9
5	- تتبع التطبيق على النص والتحليل من خلال أبرز شعراء وكتاب التراث المصري من أمثال ابن نباته المصري وابن سناءالملك وصولا إلى أدوار الدكتور محمد كامل حسين والأستاذ أمين الخولى والدكتور جمال حمدان في تناول التراث الأدبي المصري بالتحليل والدراسة المنهجية حول عبقرية المكان.	4	-	-	6
Total		**28**	-	-	**42**

5. Teaching and learning methods:

No	Topics	Face-to-Face Lecture	Online Lecture	Flipped Classroom	Presentation and movies	Discussion	Problem solving	Brain storming	Projects	Site visits	Self-learning and Research	Cooperative	Discovering	Modeling	lab

1	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.	x	x			x									
2	مصر وتراثها الأدبي من منظورحضاري 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	x	x			x									
3	التأليف الموسوعي في مصر والصياغة الأدبية في فن الموسوعات – الظواهرالأدبيةالغالبة على الأدب المصري - مناهج دراسة التراث الأدبي المصري ودلالاته – مدارس التأليف والإبداع في تاريخ الفكر المصري	x	x	x		x					x				
4	- مجالات الإبداع في الشعر المصري)الطبيعة المصرية - أدب الحروب الموضوعات الجديدة والبيئة المصرية(- مدارس الكتابة الفنية على المستوى الرسمي وغيرها	x	x			x					x				

5	- تتبع التطبيق على النص والتحليل من خلال أبرز شعراء وكتاب التراث المصري من أمثال ابن نباته المصري وابن سناءالملك وصولا إلى أدوار الدكتور محمد كامل حسين والأستاذ أمين الخولى والدكتور جمال حمدان في تناول التراث الأدبي المصري بالتحليل والدراسة المنهجية حول عبقرية المكان.	x	x		x	x					x				

6. **Teaching and learning methods for disable students:**

No.	Teaching Methods	Reason
1	Presentation of the course in digital material	Better access any time
2	Web communication with students	Better communication with certain cases
3	Asking small groups to do assignments; each composed of low ,medium and high performance students	Knowledge and skills transfer among different levels of students

7. **Student evaluation:**

7.1 Student evaluation method:

No.	Evaluation Method	Competencies	LO’s
1	Periodic exams	A9	d1,d3
2	Semester work(sheets, quizzes, presentation)	A9	d1,d3
3	Final term examination	A9	d1,d3

7.2 Evaluation Schedule:

No.	Evaluation Method	Weeks
1	Periodic exams	8_{th}
2	Student load	2_{nd} -7_{th} - 9_{th}-14_{th}
3	Final term examination	15^{th}

7.3 weighting of Evaluation:

No.	evaluation method	Marks

1	Periodic exams	10
2	Student load	10
3	Final term examination	30
Total		**50**

8. List of References:

No.	Reference List
1	Ayman Osman "**موسوعة تراث مصري**" Dawen Publishers; 2nd edition, (2019).

9. Facilities required for teaching and learning:

No.	Facility	No.	Facility
1	Lecture classroom	4	Data show system
2	Presenter	5	Sound system
3	White board		

10. Matrix of Competencies and LO's of the course:

No.	Topic	Aims	Competencies	LO's
1	تعريف الطالب بالتميز الإقليمي لمصر في العصور القديمة والوسطى والحديثة وأثر عبقرية المكان على الفكر والوعى المصري وتجلياته في التراث الأدبي شعرا ونثرا من خلال الدرس التاريخي والنصي للأدب المصري في مراحله المختلفة.	1	A9	d1,d3
2	مصر وتراثها الأدبي من منظورحضاري 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	1	A9	d1,d3

3	التأليف الموسوعي في مصر والصياغة الأدبية فن الموسوعات – الظواهر الأدبية الغالبة على الأدب المصري - مناهج دراسة التراث الأدبي المصري ودلالاته – مدارس التأليف والإبداع في تاريخ الفكر المصري	1	A9	d1,d3
4	- مجالات الإبداع في الشعر المصري)الطبيعة المصرية - أدب الحروب الموضوعات الجديدة والبيئة المصرية(- مدارس الكتابة الفنية على المستوى الرسمي وغيرها	1	A9	d1,d3
5	- تتبع التطبيق على النص والتحليل من خلال أبرز شعراء وكتاب التراث المصري من أمثال ابن نباته المصري وابن سناءالملك وصولا إلى أدوار الدكتور محمد كامل حسين والأستاذ أمين الخولى والدكتور جمال حمدان في تناول التراث الأدبي المصري بالتحليل والدراسة المنهجية حول عبقرية المكان.	1	A9	d1,d3

Course Coordinator: Dr. Mohamed elbindary
Head of Department: Ass.Dr. Hend ElsayedGadow
Date of Approval: 2023

Chemical Engineering Principles I
CHE211

1- Basic Information:

Program Title	Chemical Engineering Program
Department Offering the Program	Chemical Engineering Department
Department Responsible for the Course	Chemical Engineering Department
Course Title	Chemical Engineering Principles I
Course Code	CHE211
Year/Level	Level2
Specialization	Major
Authorization Date of Course Specification	-

Teaching hours	Lectures	Exercise	laboratory	Student's load
	2	2	-	5

2- Course Aims:

No.	Aims
9	Demonstrate current technical expertise by addressing process dynamic and control challenges in plant operations.
10	Apply research findings in Chemical Engineering Principles to exhibit their properties in order to assess the results and draw conclusions about industrial operations.

3- Intended Learning Outcomes (ILO'S)

Competencies	Learning Outcomes (LO'S)
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.
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.

4. Course Contents:

No.	Topics	Lecture	Exercise	laboratory	Student load
1	Units and dimensions	4	4	-	10
2	Basic concepts of material balances	8	8	-	20
3	Balances on non-reactive and reactive processes	12	12	-	28
4	Application of material balances on unit operations.	4	4	-	12
Total		**28**	**28**	-	**70**

5. Teaching and learning methods:

No	Topics	Face-to-Face Lecture	Online Lecture	Flipped Classroom	Presentation and movies	Discussion	Problem solving	Brain storming	Projects	Site visits	Self-learning and Research	Cooperative	Discovering	Modeling	lab
1	Dimensions and units	x	x			x	x								
2	Basic concepts of material balances	x	x			x	x	x							
3	Balances on non-reactive and reactive processes	x	x			x	x	x							
4	Application of material balances on unit operations.	x	x			x	x	x							

6. Teaching and learning methods for disable students:

No.	Teaching Methods	Reason
1	Presentation of the course in digital material	Better access any time
2	Web communication with students	Better communication with certain cases
3	Asking small groups to do assignments; each composed of low ,medium and high performance students	Knowledge and skills transfer among different levels of students

7. Student evaluation:

7.1 Student evaluation method:

No.	Evaluation Method	Competencies	LO's
1	Periodic exams	A9	d1,d2
2	Semester work(sheets,quizs)	A9,A10	d1,d2
3	Final term examination	A9,A10	d1,d2

7.2 Evaluation Schedule:

No.	Evaluation Method	Weeks
1	Periodic exams	8th
2	Student load	2nd -7th - 9th-14th
3	Final term examination	15th

7.3 weighting of Evaluation:

No.	Evaluation method	Marks
1	Periodic exams	30
2	Student load	30
3	Final term examination	90
Total		**150**

8. List of References:

No.	Reference List
1	Richard M. Felder, Ronald W. Rousseau, Lisa G. Bullard "Elementary Principles of Chemical Processes" Wiley; 4th edition, (2020).
2	Christie Geankoplis, Allen Hersel, Daniel Lepek "Transport Processes and Separation Process Principles" Pearson; 5th edition, (2018).

3	Gavin Towler, Ray Sinnott "Chemical Engineering Design: Principles, Practice and Economics of Plant and Process Design" Butterworth-Heinemann; 3rd edition, (2021).

9. Facilities required for teaching and learning:

No.	Facility	No.	Facility
1	Lecture classroom	4	Data show system
2	Presenter	5	Sound system
3	White board		

10. Matrix of Competencies and LO’s of the course:

No.	Topic	Aims	Competencies	LO’s
1	Dimensions and units	9	A9	d1,d2
2	Basic concepts of material balances	9	A9	d1,d2
3	Balances on non-reactive and reactive processes	9,10	A9	d1,d2
4	Application of material balances on unit operations.	10	A9,A10	d1,d2

Course Coordinator: Dr. /SohierAbo Bakr

Head of Department: Asso.prof. Hend Elsayed Gadow

Date of Approval: 2023

Material Science and Metallurgy

CHE212

1-Basic Information:

Program Title	Chemical Engineering Program
Department Offering the Program	Chemical Engineering Department
Department Responsible for the Course	Chemical Engineering Department
Course Title	Material Science and Metallurgy
Course Code	CHE212
Year/Level	Level 2
Specialization	Major
Authorization Date of Course Specification	-

Teaching hours	**Lectures**	**Exercise**	**laboratory**	**Student's load**
	2	2	-	3

2-Course Aims:

No.	Aims
4	Use the techniques, skills, related to materials and metallurgy engineering to 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.
6	Analyze data from intended metallurgy and material science tests in order to utilise resources creatively.

3-Competencies:

Competencies	Learning Outcomes (LO'S)
A7. Function efficiently as an individual and as a member of multi-disciplinary and multicultural teams.	d2. Work in stressful environment and within constraints. d3. Motivate individuals.
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. Professionally merge the engineering knowledge, understanding, and feedback to improve design, products and/or services.

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 materials science and material science to respond to the challenging role and responsibilities of a professional chemical engineer.

4. Course Contents:

No.	Topics	Lecture	Exercise	laboratory	Student load
1	Structure of metals and alloys(crystalline structure of metals-types of deformation)	10	10	-	15
2	Structure of ceramics and glasses (theories and applications)	4	4	-	6
3	Structure of polymers	4	4	-	6
4	Thermodynamics of condensed phase(equilibrium phase diagrams of binary systems, the iron carbon phase diagram, phase transformations in steel)	4	4	-	6
5	metals and alloys(Casting- Melting- Forming Operations- Solidification)	6	6	-	9
Total		**28**	**28**	-	**42**

5. Teaching and learning methods:

No	Topics	Face-to-Face Lecture	Online Lecture	Flipped Classroom	Presentation and movies	Discussion	Problem solving	Brain storming	Projects	Site visits	Self-learning and Research	Cooperative	Discovering	Modeling	lab

1	Structure of metals and alloys(crystalline structure of metalstypes of deformation)	x	x			x					x				
2	Structure of ceramics and glasses (theories and applications)	x	x	x		x					x				
3	Structure of polymers	x	x			x					x				
4	Thermodynamics of condensed phase(equilibrium phase diagrams of binary systems, the iron carbon phase diagram, phase transformations in steel)	x	x			x	x								
5	metals and alloys(Casting- Melting- Forming Operations- Solidification)	x	x			x	x								

6. Teaching and learning methods for disable students:

No.	Teaching Methods	Reason
1	Presentation of the course in digital material	Better access any time
2	Web communication with students	Better communication with certain cases
3	Asking small groups to do assignments; each	Knowledge and skills transfer among
	composed of low ,medium and high performance students	different levels of students

7. Student evaluation:

7.1 Student evaluation method:

No.	Evaluation Method	Competencies	LO’s
1	Periodic exams	A7	d2,d3

2	Semester work (sheets, quizs , presentation)	A7,A10	d1,d2/d3
3	Final term examination	A7,B2	d2,d3/d1

7.2 Evaluation Schedule:

No.	Evaluation Method	Weeks
1	Periodic exams	8th
2	Student load	2nd -7th - 9th-14th
3	Final term examination	15th

7.3 weighting of Evaluation:

No.	evaluation method	Marks
1	Periodic exams	20
2	Student load	20
3	Final term examination	60
Total		**100**

8. List of References:

No.	Reference List
1	William D. Callister Jr., David G. Rethwisch "Materials Science and Engineering: An Introduction" ; 10th Edition, (2018).
2	Advances in Materials Science and Engineering,2019

9. Facilities required for teaching and learning:

No.	Facility	No.	Facility
1	Lecture classroom	4	Data show system
2	Presenter	5	Sound system
3	White board		

10. Matrix of Competencies and LO's of the course:

No.	Topic	Aims	Competencies	LO's

1	Structure of metals and alloys(crystalline structure of metals-types of deformation)	4	A10	d1,d2
2	Structure of ceramics and glasses (theories and applications)	4	A10	d1,d2
3	Structure of polymers	4	B2	d1
4	Thermodynamics of condensed phase(equilibrium phase diagrams of binary systems, the iron carbon phase diagram, phase transformations in steel)	6	A7	d2,d3
5	metals and alloys(Casting- Melting- Forming Operations- Solidification)	6	B2	d1

Course Coordinator: Asso.prof. Hend Elsayed Gadow
Head of Department: Asso.prof. Hend Elsayed Gadow
Date of Approval: 2023

Principles of Engineering Design

CHE213

1-Basic Information:

Program Title	Chemical Engineering Program
Department Offering the Program	Chemical Engineering Department
Department Responsible for the Course	Basic Science and Engineering Department
Course Title	Principles of Engineering Design
Course Code	CHE213
Year/Level	Level 2
Specialization	Major
Authorization Date of Course Specification	-

Teaching hours	**Lectures**	**Exercise**	**laboratory**	**Student's load**
	2	2	-	3

2-Course Aims:

No.	Aims
1	Master a broad range of Machine Design knowledge and specialized skills, as well as the ability to understand and apply physical concept knowledge in real-world situations by applying Machine Design basic theories. Also, to Apply knowledge of science and engineering concepts to study Machine Design, and to Design a system for component, process, and mechanical component to develop a complete mechanical system.
3	Use the techniques, skills, and current engineering tools required for engineering practice of Machine Design applications by taking full responsibility for one's own learning and development, participating in lifelong learning, and demonstrating the ability to developing and design machine parts and consider the impact of Machine Design study in real world, and its strong relation with environment and almost of all the technology fields upgrades.

4- Competencies:

Competencies	Learning Outcomes (LO'S)
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. d1. Search for information to engage in lifelong self-learning discipline.
	d1. Think creatively in solving problems of design.

A9. Use creative, innovative and flexible thinking and acquire entrepreneurial and leadership skills to anticipate and respond to new situations.	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.	d2. Professionally merge the engineering knowledge, understanding, and feedback to improve design, products and/or services.
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

4. Course Contents:

No.	Topics	Lecture	Exercise	laboratory	Student load
1	Design definition Classifications of machine design Mechanical Elements Design General considerations in Machine design Phases and Interactions of the Design Process Common Dimensioning Terminology Standards and Codes	2	2	-	3
2	Forces and Stress Analysis Load and Stress Analysis, Stresses, strains and material properties Stresses and strains Analysis	6	6	-	9
3	Principal Stresses and Shear Stresses Hoop Stress, (Pressure vessels, and Pipelines) Bearing Stress	2	2	-	3
4	Torsional Shear Stress Impact Stress Bending Stress in Straight Beams Buckling of Columns	4	4	-	6

5	Power Screw Multiple Threaded Screws Terminology of Power Screw Torque Requirement, Lifting and Lowering Design of Screw and Nut, Design of Screw Jack	4	4	-	6
6	Flexible Drives Belt Drives	2	2	-	3
7	Flat Belt Pulleys Types of Pulleys for Flat Belts Cast Iron Pulleys Steel Pulleys Wooden Pulleys Rolling-Contact Bearings	6	6	-	9
8	Sliding Contact Bearings Journal Bearings Gear Drives	2	2	-	3
Total		**28**	**28**	**-**	**42**

5. Teaching and learning methods:

No	**Topics**	**Face-to-Face Lecture**	**Online Lecture**	**Flipped Classroom**	**Presentation and movies**	**Discussion**	**Problem solving**	**Brain storming**	**Projects**	**Site visits**	**Self-learning and Research**	**Cooperative**	**Discovering**	**Modeling**	**lab**

1	Design definition Classifications of machine design Mechanical Elements Design General considerations in Machine design Phases and Interactions of the Design Process Common Dimensioning Terminology Standards and Codes	x	x	x		x									
2	Forces and Stress Analysis Load and Stress Analysis, Stresses, strains and material properties Stresses and strains Analysis	x	x			x	x								
3	Principal Stresses and Shear Stresses Hoop Stress,	x	x			x	x	x							
	(Pressure vessels, and Pipelines) Bearing Stress														
4	Torsional Shear Stress Impact Stress Bending Stress in Straight Beams Buckling of Columns	x	x			x	x								

5	Power Screw Multiple Threaded Screws Terminology of Power Screw Torque Requirement, Lifting and Lowering Design of Screw and Nut, Design of Screw Jack	x	x			x	x	x							
6	Flexible Drives Belt Drives	x	x			x	x								
7	Flat Belt Pulleys Types of Pulleys for Flat Belts Cast Iron Pulleys Steel Pulleys Wooden Pulleys Rolling-Contact Bearings														
8	Sliding Contact Bearings Journal Bearings Gear Drives	x	x			x	x	x							

6. Teaching and learning methods for disable students:

No.	Teaching Methods	Reason
1	Presentation of the course in digital material	Better access any time
2	Wed communication with students	Better communication with certain cases
3	Asking small groups to do assignments; each composed of low ,medium and high performance students	Knowledge and skills transfer among different levels of students

7. Student evaluation:

7.1 Student evaluation method:

No.	Evaluation Method	Competencies	LO's
1	Periodic exams	A5,A9,A10	(a1,b1,d1),(d1,d2,d3),(d2)

2	Semester work	A5,A9,A10	(a1,b1,d1),(d1,d2,d3),(d2)
3	Final term examination	A5,A9,A10,B2	(a1,b1,d1),(d1,d2,d3),(d2),(d1)

7.2 Evaluation Schedule:

No.	Evaluation Method	Weeks
1	Periodic exams	8th
2	Student load	2nd -7th - 9th -14th
3	Final term examination	15th

7.3 weighting of Evaluation:

No.	Evaluation method	Marks
1	Periodic exams	20
2	Student load	20
3	Final term examination	60
Total		**100**

8. List of References:

No.	Reference List
1	Budynas, R. G., & Nisbett, J. K. (2019). Shigley's mechanical engineering design. Mc Graw Hill.
2	Alred, G. J., Brusaw, C. T., & Oliu, W. E. (2019). Handbook of technical writing (No. 1, pp. 1-xxii). Bedford/St. Martins,.
3	Philpot, T. A. (2019). Mechanics of materials: an integrated learning system.
4	Laplante, P. A. (2018). Technical Writing: A Practical Guide for Engineers, Scientists, and Nontechnical Professionals. CRC Pres

9. Facilities required for teaching and learning:

No.	Facility	No.	Facility
1	Lecture classroom	4	Data show system
2	Presenter	5	Sound system
3	White board		

10. Matrix of Competencies and LO's of the course:

No.	Topic	Aims	Competencies	LO's

1	Design definition Classifications of machine design Mechanical Elements Design General considerations in Machine design Phases and Interactions of the Design	1	A5,A9,A10	(a1,b1,d1),(d1,d2,d3),(d2)
2	Forces and Stress Analysis Load and Stress Analysis, Stresses, strains and material	1	A5,A9,A10	(a1,b1,d1),(d1,d2,d3),(d2)
3	Principal Stresses and Shear Stresses Hoop Stress, (Pressure vessels, and Pipelines) Bearing Stress	1	A5,A9,A10	(a1,b1,d1),(d1,d2,d3),(d2)
4	Torsional Shear Stress Impact Stress Bending Stress in Straight Beams Buckling of Columns	3	A5,A9,A10	(a1,b1,d1),(d1,d2,d3),(d2)
5	Power Screw Multiple Threaded Screws Terminology of Power Screw Torque Requirement, Lifting and Lowering Design of Screw and Nut, Design of Screw Jack	3	A5,A9,A10,B2	(a1,b1,d1),(d1,d2,d3),(d2),(d1)
6	Flexible Drives Belt Drives	3	A5,A9,A10,B2	(a1,b1,d1),(d1,d2,d3),(d2),(d1)
7	Flat Belt Pulleys Types of Pulleys for Flat Belts Cast Iron Pulleys Steel Pulleys Wooden Pulleys Rolling-Contact Bearings	3	A5,A9,A10,B2	(a1,b1,d1),(d1,d2,d3),(d2),(d1)
8	Sliding Contact Bearings	3	A5,A9,A10,B2	(a1,b1,d1),(d1,d2,d3),(d2),(d1)

	Journal Bearings Gear Drives			

Course Coordinator: Dr / Yasser Tawfik
Head of Department : Ass.prof. Hend Gadow
Date of Approval: 2023

Numerical Methods in Engineering

BAS221

1-Basic Information:

Program Title	Chemical Engineering Program
Department Offering the Program	Chemical EngineeringDepartment
Department Responsible for the Course	Basic Science and Engineering Department
Course Title	Numerical Methods in Engineering
Course Code	BAS221
Year/Level	Level: 2
Specialization	Major
Authorization Date of Course Specification	-

Teaching hours	Lectures	Exercise	laboratory	Student's load
	2	2	-	4

2-Course Aims:

No.	Aims
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 numerical theories and abstract thinking in analytic critical and systemic thinking to identify, diagnose, and solve engineering problems of varying complexity and variation.

3-Competencies:

Competencies	Learning Outcomes (LO'S)
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. b1. Using math ideas and theories that are applicable to the field.

	b2. Using scientific concepts and theories that are relevant to the profession. **c1. solve complex engineering problems by - applying the concepts and the theories of mathematics** **c2. Identify complex engineering problems by applying the concepts and the theories of sciences, appropriate to the discipline.**

4. Course Contents:

No.	Topics	Lecture	laboratory	Exercise	Student's load
1	Numerical solution of linear	4	-	4	8
2	Numerical solution of nonlinear systems	4	-	4	8
3	Numerical differentiation and integration	4	-	4	8
4	Curve fitting	4	-	4	8
5	Interpolation	4	-	4	8
6	Numerical solution of initial value problems	4	-	4	8
7	Boundary and Eigen value problems	4	-	4	8
Total		28	-	28	56

5. Teaching and learning methods:

No	Topics	Face-to-Face Lecture	Online Lecture	Flipped Classroom	Presentation and movies	Discussion	Problem solving	Brain storming	Projects	Site visits	Self-learning and Research	Cooperative	Discovering	Modeling	lab
1	Numerical solution of linear	x	X			x	x	x							
2	Numerical solution of nonlinear systems	x	X			x	x	x							
3	Numerical differentiation and integration	x	X			x	x	x							
4	Curve fitting	x	X			x	x	x							
5	Interpolation	x	X			x	x	x							
6	Numerical solution of initial value problems	x	X			x	x	x							
7	Boundary and Eigen value problems	x	X			x	x	x							

6. **Teaching and learning methods for disable students:**

No.	Teaching Methods	Reason
1	Presentation of the course in digital material	Better access any time
2	Wed communication with students	Better communication with certain cases
3	Asking small groups to do assignments; each composed of low ,medium and high performance students	Knowledge and skills transfer among different levels of students

7. **Student Evaluation:**

7.1 Student Evaluation method:

No.	Evaluation Method	Competencies	LO’s
1	**Midterm examination**	**C1**	**a1, a2, b1**
2	**Semester work (quizzes, sheets, report)**	**C1**	**a2, c1, c2**
3	**Final term examination**	**C1**	**b1, b2**

7.2 Evaluation Schedule:

No.	Evaluation Method	Weeks
1	Periodic exams	8_{th}
2	Student load	2_{nd} -7_{th} - 9_{th} -14_{th}
3	Final term examination	15^{th}

7.3 weighting of Evaluation :

No.	Evaluation Method	Marks
1	Periodic exams	20
2	Student load	20
3	Final term examination	60
	Total	**100**

8. **List of References:**

No.	Reference List
1	Steven Chapra, Raymond Canale "Numerical Methods for Engineers" McGraw Hill; 8th edition, (2020).

2	B. S. Grewal "Numerical Methods in Engineering and Science" Mercury Learning and Information (2018).

9. Facilities required for teaching and learning:

No.	Facility
1	Lecture classroom
2	Presenter
3	White board
4	Data show system
5	Sound system

10. Matrix of Competencies and LO's of the course:

No.	Topic	Aims	Competencies	LO's
1	**Numerical solution of linear**	**1**	**C1**	**a1**
2	**Numerical solution of nonlinear systems**	**1**	**C1**	**a2**
	Numerical differentiation and integration	**1**	**C1**	**a2**
3	**Curve fitting**	**1**	**C1**	**b1**
	Interpolation	**1**	**C1**	**b1**
4	**Numerical solution of initial value problems**	**1**	**C1**	**b2**
5	**Boundary and eigen value problems**	**1**	**C1**	**c1, c2**

Course Coordinator: Dr. Samar Madin

Head of Department: Ass.prof. Amal bahiry

Date of Approval: 2023

Chemical Engineering Principles II
CHE221

1-Basic Information:

Program Title	Chemical Engineering Program
Department Offering the Program	Chemical Engineering Department
Department Responsible for the Course	Chemical Engineering Department
Course Title	Chemical Engineering Principles II
Course Code	CHE221
Year/Level	Level 2
Specialization	Major
Authorization Date of Course Specification	-

Teaching hours	Lectures	Exercise	laboratory	Student's load
	3	2	-	5

2-Course Aims:

No.	Aims
7	Design a system, component, and process to meet recent technological advancements using computer systems in chemical engineering
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.

3- Competencies:

Competencies	Learning Outcomes (LO'S)
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.	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. c3. Applying 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..	b1. Judge engineering decisions considering balanced costs, benefits, safety, quality, reliability, and environmental impact. c2 .Applying engineering design procedures to generate cost-effective solutions while adhering to the principles and contexts of sustainable design and development.
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.
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.

4. Course Contents:

No.	Topics	Lecture	Exercise	laboratory	Student load
1	Simultaneous material and energy balances of complete process flow sheets.	6	4	-	10
2	Introduction of computer methods to solve chemical engineering problems	6	4	-	**10**
3	Equation-based approach and Degrees of freedom analysis	6	4	-	**10**
4	Conceptual design of chemical processes	6	4	-	**10**
5	Introduction to basic Chemical Engineering processes (e.g. humidification, binary distillation, extraction)	12	8	-	20
6	Computer-aided process design.	6	4	-	10

Total	42	28	-	70

5. Teaching and learning methods:

No	Topics	Face-to-Face Lecture	Online Lecture	Flipped Classroom	Presentation and movies	Discussion	Problem solving	Brain storming	Projects	Site visits	Self-learning and Research	Cooperative	Discovering	Modeling	lab
1	Simultaneous material and energy balances of complete process flow sheets.	x	x			x	x								
2	Introduction of computer methods to solve chemical engineering problems.	x	x				x	x							
3	Equation-based approach and Degrees of freedom analysis.	x	x				x								
4	Conceptual design of chemical processes	x	x			x	x								
5	Introduction to basic Chemical Engineering processes (e.g. humidification, binary distillation, extraction).	x	x			x	x								
6	Computer-aided process design.	x	x			x	x	x							

6. Teaching and learning methods for disable students:

No.	Teaching Methods	Reason
1	Presentation of the course in digital material	Better access any time
2	Web communication with students	Better communication with certain cases
3	Asking small groups to do assignments; each composed of low ,medium and high performance students	Knowledge and skills transfer among different levels of students

7. Student evaluation:

7.1 Student Evaluation Method:

No.	Evaluation Method	Competencies	LO's
1	Periodic exams	A2	(b4,c1,c3)
2	Semester work(sheets, quizs)	A2/A3	(b4,c1,c2) (b1,c2)
3	Final term examination	A2,A3,B1,B3	(b4,c1,c2) (b1,c2) (a1)(d1)

7.2 Evaluation Schedule:

No.	Evaluation Method	Weeks
1	Periodic exams	8^{th}
2	Student load	2^{nd} -7^{th} - 9^{th}-14^{th}
3	Final term examination	15^{th}

7.3 weighting of Evaluation:

No.	Evaluation method	Marks
1	Periodic exams	30
2	Student load	30
3	Final term examination	90
Total		**150**

8. List of References:

No.	Reference List
1	Felder and Rousseu, "Elementary principles of chemical processes", John Wiley and Sons Inc. 4th edition, 2018

9. Facilities required for teaching and learning:

No.	Facility	No.	Facility
1	Lecture classroom	4	Data show system
2	Presenter	5	Sound system
3	White board		

10. Matrix of Competencies and LO's of the course:

No.	Topic	Aims	Competencies	LO's

1	Simultaneous material and energy balances of complete process flow sheets	10	B1	a1
2	Introduction of computer methods to solve chemical engineering problems	7	A2 /B3	c1 /d1
3	Equation-based approach and Degrees of freedom analysis	9,10	A2 /B3	c1 /d1
4	Conceptual design of chemical processes	9	A3	b1,c2
5	Introduction to basic Chemical Engineering processes (e.g. humidification, binary distillation, extraction)	10	A2	b4,c3
6	Computer-aided process design	7	A2/B3	c1 /d1

Course Coordinator: Dr. Sohier Abo Bakr
Head of Department: Asso.prof. Hend Elsayed Gadow
Date of Approval: 2023

Chemical Engineering Thermodynamics

CHE222

1- Basic Information:

Program Title	Chemical Engineering Program
Department Offering the Program	Chemical Engineering Department
Department Responsible for the Course	Chemical Engineering Department
Course Title	Chemical Engineering Thermodynamics
Course Code	CHE222
Year/Level	Level 2
Specialization	Major
Authorization Date of Course Specification	-

Teaching hours	Lectures	Exercise	laboratory	Student's load
	2	2	1	4

2- Course Aims:

No.	Aims
1	Master a broad range of chemical engineering thermodynamics knowledge and specialized skills, as well as the ability to apply acquired knowledge in real-world situations by applying theories in analytic critical and systemic thinking to identify, diagnose, and solve engineering problems of varying complexity and variation.
4	Use the techniques, skills, and current of chemical engineering thermodynamics tools required for 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.

3-Competencies:

Competencies	Learning Outcomes (LO'S)
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 chemical engineering thermodynamics. a2. Explain the scientific principles and theories that apply to chemical engineering thermodynamics. b1. Use math ideas and theories that are applicable in chemical engineering thermodynamics.
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. b1. Summarize the appropriate techniques relevant to chemical engineering thermodynamics. c1. Create a process, component or system to carry out specialized chemical engineering thermodynamics.

4. Course Contents:

No.	Topics	Lecture	Exercise	laboratory	Student load
1	Thermodynamic properties of homogeneous mixtures **Practical** • Calibration of the Calorimeter • Specific Heat Capacity of an Unknown Metal	8	4	4	6
2	Partial Molal Properties **Practical** Heat of Fusion of Ice	4	4	**2**	8
3	Gibbs-Duhem Equations – Activity Coefficient **Practical** Heat of Solution	2	4	2	6

4	Fugacity. Ideal and non-ideal solutions **Practical** Heat of Neutralization	4	4	6	8
5	Heat effect of mixing	2	4		7
6	Excess properties	2	2		8
7	Phase equilibria – miscible systems	4	4		7
8	Chemical reaction equilibria	2	2		6
Total		**28**	**28**	**14**	**56**

5. **Teaching and learning methods:**

No	Topics	Face-to-Face Lecture	Online Lecture	Flipped Classroom	Presentation and movies	Discussion	Problem solving	Brain storming	Projects	Site visits	Self-learning and Research	Cooperative	Discovering	Modeling	lab
1	Thermodynamic properties of homogeneous mixtures **Practical** • Calibration of the Calorimeter • Specific Heat Capacity of an Unknown Metal	x	x												x
2	Partial Molal Properties **Practical** Heat of Fusion of Ice	x	x			x									x

3	Gibbs-Duhem Equations – Activity Coefficient **Practical** Heat of Solution	**x**	**x**												**x**
4	Fugacity. Ideal and non-ideal solutions **Practical** Heat of Neutralization	**x**	**x**			**x**									**x**
5	Heat effect of mixing	**x**	**x**												
6	Excess properties	**x**	**x**			**x**									
7	Phase equilibria – miscible systems	**x**	**x**												
8	Chemical reaction equilibria	**x**	**x**			**x**									

6. Teaching and learning methods for disable students:

No.	Teaching Methods	Reason
1	Presentation of the course in digital material	Better access any time
2	Web communication with students	Better communication with certain cases
3	Asking small groups to do assignments; each composed of low ,medium and high performance students	Knowledge and skills transfer among different levels of students

7. Student evaluation:

7.1 Student evaluation method:

No.	Evaluation Method	Competencies	LO's
1	Periodic exams	A1	a1,a2,b1

2	Semester work (sheets, quizzes, presentation)	B1	c1
3	Practical Examination	B1	c1
4	Final term examination	A1	a1,a2,b1

7.2 Evaluation Schedule:

No.	Evaluation Method	Weeks
1	Periodic exams	8th
2	Student load	2nd -7th - 9th
3	Practical Examination	14th
4	Final term examination	15th

7.3 weighting of Evaluation:

No.	Evaluation method	Marks
1	Periodic exams	20
2	Student load	20
3	Practical Examination	10
4	Final term examination	75
Total		**125**

8. List of References:

No.	Reference List
1	Introduction to Chemical Engineering Thermodynamics. (J. M. Smith, H. C. Van Ness, M. M. Abbott and M. T. Swihart),2018
2	Fundamentals of Chemical Engineering Thermodynamics. (Kevin D. Dahm and Donald P. Visco Jr.),2018

9. Facilities required for teaching and learning:

No.	Facility	No.	Facility
1	Lecture classroom	5	Data show system
2	Presenter	6	Sound system
3	White board		
4	Lab		

10. Matrix of Competencies and LO's of the course:

No.	Topic	Aims	Competencies	LO's

1	Thermodynamic properties of homogeneous mixtures **Practical** • Calibration of the Calorimeter • Specific Heat Capacity of an Unknown Metal	1	A1	a1,a2
2	Partial Molal Properties **Practical** Heat of Fusion of Ice	1	A1	b1
3	Gibbs-Duhem Equations – Activity Coefficient **Practical** Heat of Solution	1 &4	A1	a2,b1,c1
4	Fugacity. Ideal and non-ideal solutions **Practical** Heat of Neutralization	4	A1	a1
5	Heat effect of mixing	1	A1	a1
6	Excess properties	1&4	A1	a2,b1
7	Phase equilibria – miscible systems	1	A1	a2,b1
8	Chemical reaction equilibria	1	B1	a1

Course Coordinator: Dr. Mohamed Elbindary
Head of Department: Ass.prof. Hend Elsayed Gadow
Date of Approval: 2023

Analytical Chemistry
CHE223

1-Basic Information:

Program Title	Chemical Engineering Program
Department Offering the Program	Chemical Engineering Department
Department Responsible for the Course	Chemical Engineering Department
Course Title	Analytical Chemistry
Course Code	CHE223
Year/Level	Level 2
Specialization	Major
Authorization Date of Course Specification	-

Teaching hours	Lectures	Exercise	laboratory	Student's load
	2	-	2	4

2-Course Aims:

No.	Aims
1	Master a broad range of analytical chemistry engineering knowledge and specialized skills, as well as the ability to apply acquired knowledge rom analytical chemistry in real-world situations by applying theories in analytic critical and systemic thinking to identify, diagnose, and solve engineering problems of varying complexity and variation.
6	Analyze data from the analytical chemistry experiments to manage resources creatively.
10	Apply research findings in analytical chemistry in order to assess the results and draw conclusions about industrial operations.

3-Competencies:

Competencies	Learning Outcomes (LO'S)
A6. Plan, supervise and monitor implementation of engineering projects, taking into consideration other trades requirements	a1.Demonstrate how to conduct a chemical analysis and characterization of typical engineering materials and components using standard methodologies. b1. interpret data acquired from laboratory observation using graphs and curves c2. Acquire entrepreneurial skills
B3. Apply numerical modeling methods and/or computational techniques appropriate to chemical engineering.	d1.Apply computational techniques appropriate to analytical chemistry

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.	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
A9. Use creative, innovative and flexible thinking and acquire entrepreneurial and leadership skills to anticipate and respond to new situations.	d2. Manage effectively for tasks, time and resources. d3. Refer to relevant literatures.

4. Course Contents:

No.	Topics	Lecture	Exercise	laboratory	Student load
1	Basic tools in analytical chemistry **Practical** Preparation of Standard Solution of solid salt Preparation of a Standard Solution of concentrated Acid	4	-	4	8
2	Titrimetric Methods of Analysis **Practical** • Mohr's method for determining chloride • EDTA standardization against metallic magnesium • Determination of magnesium using eriochrome black T indicator Determination of aluminum using EBT as indicator (back –titration)	8	-	10	16
3	Gravimetric Methods of Analysis **Practical** Gravimetric Analysis	4	-	6	8
4	Evaluating Analytical Data	8	-	-	16

5	Instrumental chemical analysis **Practical** • Conductimetry • PH meters Spectrophotometer	4	-	8	8
Total		**28**	**-**	**28**	**56**

5. Teaching and learning methods:

No	Topics	Face-to-Face Lecture	Online Lecture	Flipped Classroom	Presentation and movies	Discussion	Problem solving	Brain storming	Projects	Site visits	Self-learning and Research	Cooperative	Discovering	Modeling	lab
1	Basic tools in analytical chemistry **Practical** • Preparation of Standard Solution of solid salt • Preparation of a Standard Solution of concentrated Acid	x	x			x									x

2	Titrimetric Methods of Analysis **Practical** • Mohr's method for determining chloride • EDTA standardization against metallic magnesium • Determination of magnesium using eriochrome black T indicator • Determination of aluminum using EBT as indicator (back –titration)	**x**	**x**												**x**
3	Gravimetric Methods of Analysis **Practical** Gravimetric Analysis	**x**	**x**												**x**
4	Evaluating Analytical Data	**x**	**x**			**x**									
5	Instrumental chemical analysis **Practical** • Conductimetry • PH meters • Spectrophotometer	**x**	**x**								**x**				**x**

6. Teaching and learning methods for disable students:

No.	Teaching Methods	Reason
1	Presentation of the course in digital material	Better access any time
2	Web communication with students	Better communication with certain cases
3	Asking small groups to do assignments; each composed of low ,medium and high performance students	Knowledge and skills transfer among different levels of students

7. Student evaluation:

7.1 Student evaluation method:

No.	Evaluation Method	Competencies	LO's
1	Periodic exams	A2/A6	(b2,b3)(a1,b1,c2)
2	Semester work (sheets ,quizzes , presentation)	A2/A6	(b2,b3)(a1,b1,c2)
3	Practical Examination	A2/A6/A9/B3	(b2,b3)(a1,b1,c2)(d2,d3)(d1)
4	Final term examination	A2/A6/A9/B3	(b2,b3)(a1,b1,c2)(d2,d3)(d1)

7.2 Evaluation Schedule:

No.	Evaluation Method	Weeks
1	Periodic exams	8th
2	Student load	2nd -7th - 9th
3	Practical Examination	14th
4	Final term examination	15th

7.3 weighting of Evaluation:

No.	Evaluation method	Marks
1	Periodic exams	20
2	Student load	20
3	Practical Examination	10
4	Final term examination	60
Total		**100**

8. List of References:

No.	Reference List
1	A Textbook of Analytical Chemistry Kindle Edition by Y. Anjaneyulu (Author), K. Chandrasekhar (Author),2019
2	Douglas A. Skoog, Donald M. West, F. James Holler, Stanley R. Crouch "Fundamentals of Analytical Chemistry" Cengage Learning; 10th edition, (2021).

9. Facilities required for teaching and learning:

No.	Facility	No.	Facility
1	Lecture classroom	5	Data show system
2	Presenter	6	Sound system
3	White board		
4	Lab		

10. Matrix of Competencies and LO's of the course:

No.	Topic	Aims	Competencies	LO's
1	Basic tools in analytical chemistry **Practical** • Preparation of Standard Solution of solid salt • Preparation of a Standard Solution of concentrated Acid	1	A2/A9	b2,b3/d2,d3
2	Titrimetric Methods of Analysis **Practical** • Mohr's method for determining chloride • EDTA standardization against metallic magnesium • Determination of magnesium using eriochrome black T indicator • Determination of aluminum using EBT as indicator (back –titration)	6	A6 /A9	a1/d2,d3
3	Gravimetric Methods of Analysis **Practical** Gravimetric Analysis	6	A6/A9	a1,c2 /d2,d3
4	Evaluating Analytical Data	10	A6	b1,c2
5	Instrumental chemical analysis **Practical** • Conductimetry • PH meters • Spectrophotometer	6,10	A9/B3	d1/d2.d3

Course Coordinator: Asso.prof. Hend Elsayed Gadow

Head of Department: Asso.prof. Hend Elsayed Gadow

Date of Approval: 2023

Process Dynamics and Control
CHE224

1-Basic Information:

Program Title	Chemical Engineering Program
Department Offering the Program	Chemical Engineering Department
Department Responsible for the Course	Chemical Engineering Department
Course Title	Process Dynamics and Control
Course Code	CHE224
Year/Level	Level 2
Specialization	Major
Authorization Date of Course Specification	-

Teaching hours	Lectures	Exercise	laboratory	Student's load
	2	2	-	4

2-Course Aims:

No.	Aims
4	Use the techniques, skills, and current engineering tools required for process dynamics and control 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.
9	Demonstrate current technical expertise by addressing process dynamic and control challenges in plant operations.
10	Apply research findings chemical reactions on process dynamics and control to exhibit their properties in order to assess the results and draw conclusions about industrial operations.

3- Competencies :

Competencies	Learning Outcomes (LO'S)
A6. Plan, supervise and monitor implementation of engineering projects, taking into consideration other trades requirements.	b1. interpret data derived from laboratory observation from equipment flow sheets, charts and curves to interpret data derived from laboratory observation. Analyze and interpret data. c2. Acquire entrepreneurial skills.

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.	c1. Choose relevant mathematical and computer-based methodologies for problem modeling and analysis.
A4. Utilize contemporary technologies, codes of practice and standards, quality guidelines, health and safety requirements, environmental issues and risk management principles.	a3. Define contemporary engineering technologies and their applications in relation to disciplines.
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.

4. Course Contents:

No.	Topics	Lecture	Exercise	laboratory	Student load
1	Automatic control merits and basic features **Practical** Introduction and experiments demonstrating the principles of temperature measuring devices	2	2	-	4
2	Classification of control action (openloop and closed-loop, feed-back and feed-forward, process and position control) **Practical** •Introduction and experiments demonstrating the principles of pressure measuring devices	4	4	-	8
3	Mathematical tools (Linearization, Laplace transforms and block diagram algebra) **Practical** •Introduction and experiments demonstrating the principles of flow and concentration measuring devices	4	4	-	8

4	Process dynamics (first, second and higher orders) **Practical** Process control simulation for compressor.	2	2	-	4
5	Measuring and actuating elements **Practical** Process control simulation for Heat exchanger.	4	4	-	8
6	Two-position controller and Three-term controller **Practical** Process control simulation for Separator.	4	4	-	8
7	Controller mechanism and optimum setting **Practical** Process control simulation for reactors.	4	4	-	8
8	System stability (algebraic and graphical methods). **Practical** Process control simulation for reactors.	4	4	-	8
Total		**28**	**28**	**-**	**56**

5. **Teaching and learning methods:**

No	Topics	Face-to-Face Lecture	Online Lecture	Flipped Classroom	Presentation and movies	Discussion	Problem solving	Brain storming	Projects	Site visits	Self-learning and Research	Cooperative	Discovering	Modeling	lab

1	Automatic control merits and basic features **Practical** Introduction and experiments demonstrating the principles of temperature measuring devices	**x**	**x**				**x**								**x**
2	Classification of control action (openloop and closed-loop, feed-back and feedforward, process and position control) **Practical** • Introduction and experiments demonstrating the principles of pressure measuring devices	**x**	**x**			**x**	**x**								**x**
3	Mathematical tools (Linearization, Laplace transforms and block diagram algebra) **Practical** • Introduction and experiments demonstrating the principles of flow and concentration measuring devices	**x**	**x**			**x**	**x**	**x**							**x**

4	Process dynamics (first, second and higher orders) **Practical** □Process control simulation for compressor.	x	x				x	x							x
5	Measuring and actuating elements **Practical** □Process control simulation for Heat exchanger.	x	x				x								x
6	Two-position controller and Three-term controller **Practical** □Process control simulation for Separator.	x	x			x	x	x							x
7	Controller mechanism and optimum setting **Practical** □Process control simulation for reactors.	x	x			x	x								x
8	System stability (algebraic and graphical methods). **Practical** □Process control simulation for reactors.	x	x			x	x								x

6. Teaching and learning methods for disable students:

No.	Teaching Methods	Reason
1	Presentation of the course in digital material	Better access any time
2	Web communication with students	Better communication with certain cases

3	Asking small groups to do assignments; each composed of low ,medium and high performance students	Knowledge and skills transfer among different levels of students

7. Student evaluation:

7.1 Student evaluation method:

No.	Evaluation Method	Competencies	LO's
1	Periodic exams	A2	c1
2	Semester work (Quiz & sheets, reports)	B3/A6	d1/c2
3	Practical Examination	B3/A4	d1/a3
4	Final term examination	A2,A6,B3	b1,c2,d1

7.2 Evaluation Schedule:

No.	Evaluation Method	Weeks
1	Periodic exams	8th
2	Student load	2nd -7th - 9th
3	Practical Examination	14th
4	Final term examination	15th

7.3 weighting of Evaluation:

No.	Evaluation method	Marks
1	Periodic exams	20
2	Student load	20
3	Final term examination	60
Total		**100**

8. List of References:

No.	Reference List
1	Jean-Pierre Corriou "Process Control Theory and Applications" Springer, (2018).
2	Jose A. Romagnoli "Introduction to Process Control" CRC Press; 3rd Edition, (2020).
3	Raghunathan Rengaswamy, Babji Srinivasan, Nirav Pravinbhai Bhatt "Process Control Fundamentals Analysis, Design, Assessment, and Diagnosis" CRC Press ; 1st Edition, (2020).

9. Facilities required for teaching and learning:

No.	Facility	No.	Facility
1	Lecture classroom	5	Data show system
2	Presenter	6	Sound system
3	White board		
4	Lab		

10. Matrix of Competencies and LO's of the course:

No.	Topic	Aims	Competencies	LO's
1	Automatic control merits and basic features	4	A2/A4	c1/a3
	Practical Introduction and experiments demonstrating the principles of temperature measuring devices			
2	Classification of control action (openloop and closed-loop, feed-back and feed-forward, process and position control)	4	A6	b1
	Practical • Introduction and experiments demonstrating the principles of pressure measuring devices			
3	Mathematical tools (Linearization, Laplace transforms and block diagram algebra)	4,10	A2/B3	c1/d1
	Practical • Introduction and experiments demonstrating the principles of flow and concentration measuring devices			
4	Process dynamics (first, second and higher orders)	4	A2/B3	c1/d1
	Practical Process control simulation for compressor			
5	Measuring and actuating elements	4	A2/A4/B3	c1/a3/d1
	Practical			

	Process control simulation for Heat exchanger.			
6	Two-position controller and Three-term controller **Practical** Process control simulation for Separator.	4,9	A2/A4/B3	c1/a3/d1
7	Controller mechanism and optimum setting **Practical** Process control simulation for reactors	9	A6	b1
8	System stability (algebraic and graphical methods). **Practical** ·Process control simulation for reactors.	10	A6/B3	b1,c2/d1

Course Coordinator: Asso. prof. Taha Farag

Head of Department: Asso. prof. Hend Elsayed Gadow

Date of Approval: 2023

Heat Transfer
CHE225

1-Basic Information:

Program Title	Chemical Engineering Program
Department Offering the Program	Chemical Engineering Department
Department Responsible for the Course	Chemical Engineering Department
Course Title	Heat Transfer
Course Code	CHE225
Year/Level	Level 2
Specialization	Major
Authorization Date of Course Specification	-

Teaching hours	Lectures	Exercise	laboratory	Student's load
	2	2	1	3

2-Course Aims:

No.	Aims
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.
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.

3- Competencies:

Competencies	Learning Outcomes (LO'S)
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.	b3. Analyze and interpret data b4. Evaluate components, systems, and processes are evaluated for their characteristics and performance. c2. Develop suitable experimentation and/or simulation. c3. Applying statistical analyses and objective engineering judgment to draw conclusions.

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. Professionally merge the engineering knowledge, understanding, and feedback to improve design, products and/or services.
B4. Adopt suitable national and international standards and codes to: design, operate, inspect and maintain chemical engineering systems**.**	d1. Engage suitable national and international standards and codes to: design, operate, inspect and maintain heat transfer systems.

4. Course Contents:

No.	Topics	Lecture	Exercise	laboratory	Student load
1	Introduction to heat transfer : conduction ,convection ,thermal radiation	6	6	2	8
2	The heat diffusion equation :Cartesian ,cylindrical ,spherical coordiates	6	6	2	8
3	One dimensional St.St conduction	4	4	2	6
4	External ,internal flow convection	4	4	2	8
5	heat exchangers Practical • Conduction ,Convection ,Radiation Drop wise ,film condensation ,nucleate film boil , Heat exchanger	8	8	6	6
Total		**28**	**28**	**14**	**42**

5. Teaching and learning methods:

No	Topics	Face-to-Face Lecture	Online Lecture	Flipped Classroom	Presentation and movies	Discussion	Problem solving	Brain storming	Projects	Site visits	Self-learning and Research	Cooperative	Discovering	Modeling	lab
1	Introduction to heat transfer : conduction ,convection ,thermal radiation	x	x			x					x				
2	The heat diffusion equation :Cartesian ,cylindrical ,spherical coordiates	x	x												x
3	One dimensional St.St conduction	x	x			x	x								
4	External ,internal flow convection	x	x			x	x				x				
5	heat exchangers Practical • Conduction ,Convection ,Radiation Drop wise ,film condensation ,nucleate film boil , Heat exchanger	x	x			x	x	x							

6. **Teaching and learning methods for disable students:**

No.	Teaching Methods	Reason
1	Presentation of the course in digital material	Better access any time
2	Web communication with students	Better communication with certain cases
3	Asking small groups to do assignments; each composed of low ,medium and high performance students	Knowledge and skills transfer among different levels of students

7. **Student evaluation:**

7.1 Student evaluation method:

No.	Evaluation Method	Competencies	LO's
1	Periodic exams	A2/A10	d2,b3/b4
2	Semester work	A10	d1,d2
3	Final term examination	A2/B4	b3,b4,c2,c3,d1

7.2 Evaluation Schedule:

No.	Evaluation Method	Weeks
1	Periodic exams	8th
2	Student load	2nd -7th - 9th
3	Practical Examination	14th
4	Final term examination	15th

7.3 weighting of Evaluation:

No.	Evaluation method	Marks
1	Periodic exams	20
2	Student load	20
3	Practical Examination	10
4	Final term examination	75
Total		**125**

8. **List of References:**

No.	Reference List
1	FRANK P. INCROPERA P. DEWITT "Incroperas Principles Of Heat And Mass Transfer " WILEY INDIA; , (2018).

2	Theodore L. Bergman, Adrienne S. Lavine, Frank P. Incropera, David P. DeWitt "Fundamentals of Heat and Mass Transfer" WILEY; 8th edition, (2018).
3	CENGEL "Heat and Mass Transfer" MC GRAW HILL INDIA; 6th edition, (2019).

9. Facilities required for teaching and learning:

No.	Facility	No.	Facility
1	Lecture classroom	5	Data show system
2	Presenter	6	Sound system
3	White board		
4	Lab		

10. Matrix of Competencies and LO's of the course:

No.	Topic	Aims	Competencies	LO's
1	Introduction to heat transfer : conduction ,convection ,thermal radiation	4	A10	d2
2	The heat diffusion equation: Cartesian, cylindrical, sphericalcoordinates	6	A10 / A2	d2, b4,c2,c3
3	One dimensional St.St conduction	4	A10	d2
4	External ,internal flow convection	4	A10	d1
5	heat exchangers Practical • Conduction, Convection, Radiation Drop wise ,film condensation ,nucleate film boil , Heat exchanger	7,6	B4/A10	d1/d2

Course Coordinator: Dr / Riham Atef

Head of Department: Asso.prof. Hend Elsayed Gadow

Date of Approval: 2023

Training 1
CHE226

1. Basic Information:

Program Title	Chemical Engineering program
Department Offering the Program	Chemical Engineering department
Department Responsible for the Course	Chemical Engineering department
Course Title	Training 1
Course Code	CHE226
Year/Level	Level:2
Specialization	Major
Authorization Date of Course Specification	-

Teaching hours	Lectures	Exercise	laboratory	Student's load
	-	-	-	-

2. Course Aims:

No.	Aims
6	Analyze data from the intended tests to manage resources creatively.
7	Consider the impact of chemical process industries on society, economics, and the environment using fundamental knowledge of chemical process industries.

3-Competencies:

Competencies	Learning Outcomes (LO'S)
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.
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.
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.	**b1** Summarize the appropriate techniques relevant to different industries. **c1** Create a process, component or system to carry out specialized engineering designs.

4. **Course Contents:**

No.	Topics	Lecture	Exercise	laboratory	Student load
1	Students in the field training of chemical engineering they will be expected to apply Principles of Chemical Engineering analysis	-	-	-	-
2	Reports and presentations will be emphasized in addition to the technical content	-	-	-	-
Total		-	-	-	-

5. **Teaching and learning methods:**

No	Topics	Face-to-Face Lecture	Online Lecture	Flipped Classroom	Presentation and movies	Discussion	Problem solving	Brain storming	Projects	Site visits	Self-learning and Research	Cooperative	Discovering	Modeling	lab
1	Students in the field training of chemical engineering they will be expected to apply Principles of Chemical Engineering analysis	x			x				x	x	x	x			
2	Reports and presentations will be emphasized in addition to the technical content	x			x				x	x	x	x			

6. Teaching and learning methods for disable students:

No.	Teaching Methods	Reason
1	Presentation of the course in digital material	Better access any time
2	Web communication with students	Better communication with certain cases
3	Asking small groups to do assignments; each composed of low ,medium and high performance students	Knowledge and skills transfer among different levels of students

7. Student evaluation:

7.1 Student Evaluation Method:

No	Evaluation Method	Competencies	LO's
1 .	Oral Examination	A5/A7	a1,b1/d1,d2,d3
2	Final report (presentation, Report)	A8/B1	d1,d2/b1,c1

7.2 Evaluation Schedule:

No.	Evaluation Method	Weeks

1	Oral Examination	at the end of training
2	FINAL report (presentation, Report)	4th -8th

7.3 weighting of Evaluation:

No.	Evaluation Method	Marks
1	Oral Examination	30
2	Final work (presentation, Report)	20
Total		**50**

8. List of References:

No.	Reference List
1	Subject studies

9. Facilities required for teaching and learning:

No.	Facility	No.	Facility
1	Lecture classroom	5	Data show system
2	Presenter	6	Sound system
3	White board		
4	Industrial field		

10. Matrix of Competencies and LO's of the course:

No.	Topic	Aims	Competencies	LO's
1	Students in the field training of chemical engineering they will be expected to apply Principles of Chemical Engineering analysis	6,7	A5/A7	a1,b1/d1,d2, d3
2	Reports and presentations will be emphasized in addition to the technical content	6,7	A8/B1	d1,d2/b1,c1

CourseCoordinator: Asso.prof. Hend Elsayed Gadow

Head of Department: Asso.prof. Hend Elsayed Gadow

Date of Approval: 2023

Environmental Management
(BAS311)

1-Basic Information:

Program Title	Chemical Engineering Program
Department Offering the Program	Chemical Engineering Department
Department Responsible for the Course	Basic Science and Engineering Department
Course Title	Environmental Management
Course Code	BAS311
Year/Level	level 3
Specialization	Major
Authorization Date of Course Specification	-

Teaching hours	**Lectures**	**Exercise**	**laboratory**	**Student's load**
	2	1	-	3

2-Course Aims:

No.	Aims
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;

3- Competencies:

Competencies	Learning Outcomes (LO'S)
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.	**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.
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. **c1**. Apply safe systems at work by taking the necessary precautions to manage hazards. **c3**. Utilize modern technologies.
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.

4. Course Contents:

No.	Topics	Lecture	Exercise	laboratory	Student load
1	The importance of studying environmental science – modern technology and its effect on the environment	8	2	-	12
2	quality of the environment and development elements	4	3	-	6
3	sources of environmental pollution and method of control (air pollution – water pollution)	8	6	-	12

4	Solid wastes pollution – noise) – economics of environmental pollution control – legislations for the environment protection.	8	3	-	12
Total		**28**	**14**	**-**	**42**

5. **Teaching and learning methods:**

No	**Topics**	**Face-to-Face Lecture**	**Online Lecture**	**Flipped Classroom**	**Presentation and movies**	**Discussion**	**Problem solving**	**Brain storming**	**Projects**	**Site visits**	**Self-learning and Research**	**Cooperative**	**Discovering**	**Modeling**	**lab**
1	The importance of studying environmental science – modern technology and its effect on the environment	**x**	**x**			**x**					**x**				
2	quality of the environment and development elements	**x**	**x**	**x**		**x**					**x**				
3	sources of environmental pollution and method of control (air pollution – water pollution)	**x**	**x**			**x**		**x**			**x**				

4	Solid wastes pollution – noise) – economics of environmental pollution control – legislations for the environment protection.	x	x	x		x		x			x				

6. **Teaching and learning methods for disable students:**

No.	Teaching Methods	Reason
1	Presentation of the course in digital material.	Better access any time.
2	Asking small groups to do assignments; each composed of low, medium, and high performance students.	Knowledge and skills transfer among different levels of students.

7. **Student evaluation:**

7.1 Student evaluation method:

No.	Evaluation Method	Competencies	LO's
1	Periodic exams	A3,A4	a2,b1 ,a1, c1
2	Semester work(report, quizzes, presentation)	A10,A4	d1,c1,c3
3	Final Term Examination	A3,A4,A10	a3,a1,d1

7.2 Evaluation Schedule:

No.	Evaluation Method	Weeks
1	Student load	2nd, 7th , 9th
2	Periodic exams	8th
3	Final Term Examination	15_{th}

7.3 weighting of Evaluation:

No.	evaluation method	Marks
1	Periodic exams	20
2	Student load	20
3	Final-term examination	60
Total		**100**

8. **List of References:**

No.	Reference List

1	David A. Anderson "Environmental Economics and Natural Resource Management" Routledge; 5th edition, (2019).
2	John Morelli "Voluntary Environmental Management" CRC Press; 1st edition, (2020).
3	Marc Lame "Environmental Management" Cambridge University Press; , (2023).
4	Tracy Dathe, René Dathe, Isabel Dathe, Marc Helmold "Corporate Social Responsibility (CSR), Sustainability and Environmental Social Governance (ESG)" Springer ; , (2023).
5	International Organization for Standardization "ISO 14001:2015 - Environmental Management Systems - A practical guide for SMEs" Multiple. Distributed through American National Standards Institute (ANSI); , (2017).

9. Facilities required for teaching and learning:

No.	Facility
1	Seminar
2	Lecture Classroom
3	White Board
4	Data Show system

10. Matrix of Competencies and LO's of the course:

No.	Topic	Aims	Competencies	LO's
1	The importance of studying environmental science – modern technology and its effect on the environment	2,3	A10,A3	d1,a2
2	Quality of the environment and development elements	2,3	A10,A3,A4	d1,b1,a1
3	Sources of environmental pollution and method of control (air pollution – water pollution	2,3	A3,A4	a3,c1
4	Solid wastes pollution – noise) – economics of environmental pollution control – legislations for the environment protection.	2,3	A3,A4	c1,c3

Course Coordinator: Dr. Ramadan Elkateb
Head of Department: Ass.prof. Amal bahiry
Date of Approval: 2023

Reactor Design
CHE311

1-Basic Information:

Program Title	Chemical Engineering Program
Department Offering the Program	Chemical Engineering Department
Department Responsible for the Course	Chemical Engineering Department
Course Title	Reactor Design
Course Code	CHE311
Year/Level	Level 3
Specialization	Major
Authorization Date of Course Specification	-

Teaching hours	Lectures	Exercise	laboratory	Student's load
	2	2	-	4

2-Course Aims:

No.	Aims
7	Design a system components and process to meet recent technological using computational system in reactor design .
10	Apply research findings in Reactor design to exhibit their properties in order to assess the results and draw conclusions about Reactor design.

3- Competencies:

Competencies	Learning Outcomes (LO'S)
A6. Plan, supervise and monitor implementation of engineering projects, taking into consideration other trades requirements	**a1**.Demonstrate how to conduct a reactor design and characterization of typical reactor design materials and components using standard methodologies. **b1**. interpret data acquired from laboratory observation using graphs and curves **c1**.Acquire entrepreneurial skills

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

4. Course Contents:

No.	Topics	Lecture	Exercise	laboratory	Student load
1	Fundamentals of thermodynamics and kinetics of chemical reactions	2	2	-	4
2	Analysis of batch, plug-flow and continuous stirred tank reactors for different types of reactions	4	4	-	8
3	Non ideal reactor analysis, including residence time distribution, back mixing and dispersion models	2	2	-	4
4	Kinetics of isothermal and nonisothermal ideal reactors.	2	2	-	4
5	Kinetics of heterogeneous or catalytic reactions	4	4	-	8
6	Design of different types of catalytic and non-catalytic reactors	2	2	-	4
7	Mass and energy transfer limitations in heterogeneous reaction systems	2	2	-	4
8	Catalyst effectiveness	4	4	-	8
9	Reactor stability and sensitivity to operating parameters	2	2	-	4
10	Optimization of reactor design and Factors affecting choice of reactors	4	4	-	8
Total		**28**	**28**	**-**	**56**

5. Teaching and learning methods:

No	Topics	Face-to-Face Lecture	Online Lecture	Flipped Classroom	Presentation and movies	Discussion	Problem solving	Brain storming	Projects	Site visits	Self-learning and	Cooperative	Discovering	Modeling	lab
1	Fundamentals of thermodynamics and kinetics of chemical reactions	x	x			x					x				
2	Analysis of batch, plug-flow and continuous stirred tank reactors for different types of reactions	x	x	x		x					x				
3	Non ideal reactor analysis, including residence time distribution, back mixing and dispersion models	x	x			x		x			x				
4	Kinetics of isothermal and non-isothermal ideal reactors.	x	x	x		x		x			x				
5	Kinetics of heterogeneous or catalytic reactions	x	x	x		x		x			x				

6	Design of different types of catalytic and non-catalytic reactors	x	x	x		x		x			x				
7	Mass and energy transfer limitations in heterogeneous reaction systems	x	x	x		x		x			x				
8	Catalyst effectiveness	x	x	x		x		x			x				
9	Reactor stability and sensitivity to operating parameters	x	x	x		x		x			x				
10	Optimization of reactor design and Factors affecting choice of reactors	x	x	x		x		x			x				

6. Teaching and learning methods for disable students:

No.	Teaching Methods	Reason
1	Presentation of the course in digital material	Better access any time
2	Web communication with students	Better communication with certain cases
3	Asking small groups to do assignments; each composed of low ,medium and high performance students	Knowledge and skills transfer among different levels of students

7. Student evaluation:

7.1 Student Evaluation Method:

No.	Evaluation Method	Competencies	LO's
1	Periodic exams	A6	b1,c1
2	Semester work(report, quizzes, presentation)	A6/B1	c1/c1
3	Final Term Examination	A6/B1	a1/a1

7.2 Evaluation Schedule:

No.	Evaluation Method	Weeks
1	Periodic exams	8th
2	Student load	2nd -7th - 9th-14th

3	Final term examination	15th

7.3 weighting of Evaluation:

No.	Evaluation Method	Marks
1	Periodic exams	30
2	Student load	20
3	Final term examination	75
Total		**125**

8. List of References:

No.	Reference List
1	Course notes Lecture notes prepared by Ass. Prof. Dr./Taha E. Farrag.
2	Juan A. Conesa "Chemical Reactor Design: Mathematical Modeling and Applications" Wiley, (2020).
3	Jorge Ancheyta "Chemical Reaction Kinetics: Concepts, Methods and Case Studies" John Wiley &Sons Ltd., (2017).
4	Ernő Keszei "Reaction Kinetics" Springer, (2021).

9. Facilities required for teaching and learning:

No.	Facility	No.	Facility
1	Lecture classroom	4	Data show system
2	Presenter	5	Sound system
3	White board		

10. Matrix of Competencies and LO's of the course:

No.	Topic	Aims	Competencies	LO's
1	Fundamentals of thermodynamics and kinetics of chemical reactions	10	B1	a1
2	Analysis of batch, plug-flow and continuous stirred tank reactors for different types of reactions	10	A6	a1,b1

3	Non ideal reactor analysis, including residence time distribution, back mixing and dispersion models	10	A6	a1,b1
4	Kinetics of isothermal and non-isothermal ideal reactors.	10	A6	a1,b1
5	Kinetics of heterogeneous or catalytic reactions	10	A6	a1,b1
6	Design of different types of catalytic and noncatalytic reactors	7	B1	c1
7	Mass and energy transfer limitations in heterogeneous reaction systems	7,10	B1	a1
8	Catalyst effectiveness	10	A6	a1,c1
9	Reactor stability and sensitivity to operating parameters	7	B1	c1
10	Optimization of reactor design and Factors affecting choice of reactors	7	B1	c1

Course Coordinator: Prof. Dr. / Taha E. Farrag

Head of Department: Asso.prof. Hend Elsayed Gadow
Date of Approval: 2023

Operation Researches

(CHE312)

1-Basic Information:

Program Title	Chemical Engineering Program
Department Offering the Program	Chemical Engineering Department
Department Responsible for the Course	Basic Science and Engineering Department
Course Title	Operation Researches
Course Code	CHE312
Year/Level	Level 3
Specialization	Major
Authorization Date of Course Specification	-

Teaching hours	Lectures	Exercise	laboratory	Student's load
	2	2	-	4

2-Course Aims:

No.	Aims
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 operations research 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.
10	Apply research findings chemical reactions on operations research to exhibit their properties in order to assess the results and draw conclusions about industrial operations .

3- Competencies:

Competencies	Learning Outcomes (LO'S)
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 operations research 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. **b3.** Analyze and interpret data and apply it on operations research

A3. Utilize contemporary technologies, codes of practice and standards, quality guidelines, health and safety requirements, environmental issues and risk management principles.	**a2.** List the engineering operation research management principles **b1.** Create methodical approaches related to operation research when dealing with new and advancing technology. **c2.** Use essential project management related to operation research.
A6. Plan, supervise and monitor implementation of engineering projects, taking into consideration other trades requirements.	**b1.** Interpret data derived from laboratory observation from equipment flow sheets, charts and curves to interpret data derived from laboratory observation. **c2.** Acquire entrepreneurial skills.

4-Course Contents:

No.	Topics	Lecture	Exercise	laboratory	Student load
1	Models and methods of operations research in solving engineering and management problems.	4	4	-	8
2	Linear programming, simplex method, duality, sensitivity analysis	4	4	-	8
3	Transportation, assignment and transshipment models	4	4	-	8
4	Network flows models and integer programming	4	4	-	8
5	Probabilistic models in operations research problems	4	4	-	8
6	Queuing theory, Markov chain and decision analysis	4	4	-	8
7	Marko vain decision process and utility functions	4	4	-	8
Total		**28**	**28**	-	**56**

5. Teaching and learning methods:

No	Topics	Face-to-Face Lecture	Online Lecture	Flipped Classroom	Presentation and movies	Discussion	Problem solving	Brain storming	Projects	Site visits	Self-learning and Research	Cooperative	Discovering	Modeling	lab
1	Models and methods of operations research in solving engineering and management problems.	x	x			x	x								
2	Linear programming, simplex method, duality, sensitivity analysis	x	x			x	x								
3	Transportation, assignment and transshipment models	x	x			x	x	x							
4	Network flows models and integer programming	x	x			x									
5	Probabilistic models in operations research problems	x	x			x	x								
6	Queuing theory, Markov chain and decision analysis	x	x			x	x								

7	Marko vain decision process and utility functions	x	x			x	x								

6. Teaching and learning methods for disable students:

No.	Teaching Methods	Reason
1	Presentation of the course in digital material	Better access any time
2	Wed communication with students	Better communication with certain cases
3	Asking small groups to do assignments; each composed of low ,medium and high performance students	Knowledge and skills transfer among different levels of students

7. Student evaluation:

7.1 Student evaluation method:

No.	Evaluation Method	Competencies	LO's
1	Periodic exams	A2/A6	a1,b3/b1
2	Semester work	A3/A6	a2,b1,c2/c2
3	Final term examination	A2/A6	a1, b3/ b1

7.2 Evaluation Schedule:

No.	Evaluation Method	Weeks
1	Periodic exams	8_{th}
2	Student load	2_{nd} -7_{th} - 9_{th} -14_{th}
3	Final term examination	15^{th}

7.3 weighting of Evaluation:

No.	Evaluation method	Marks
1	Periodic exams	20
2	Student load	20
3	Final term examination	60
Total		**100**

8. List of References:

No.	Reference List

1	Gerhard-Wilhelm Weber, Hajar Farnoudkia , Vilda Purutçuoğlu "Operations Research: New Paradigms and Emerging Applications" CRC Press; 1st edition, (2023).
2	Hamdy A Taha "Operations Research: An Introduction" Pearson India; 10th edition, (2018).

9. Facilities required for teaching and learning:

No.	Facility	No.	Facility
1	Lecture classroom	4	Data show system
2	Presenter	5	Sound system
3	White board		

10. Matrix of Competencies and LO's of the course:

No	Topic	Aims	Competencies	LO's
1	Models and methods of operations research in solving engineering and management problems.	3,4	A2	a1
2	Linear programming, simplex method, duality, sensitivity analysis	4	A2	b3
3	transportation, assignment and transshipment models	3	A6	b1
4	network flows models and integer programming	10	A6	b1,c2
5	Probabilistic models in operations research problems	10	A3	a2
6	Queuing theory, Markov chain and decision analysis	3,4	A3	b1
7	Marko vain decision process and utility functions	3,4	A3	c2

Course Coordinator: Dr. Sohir Abo bakr

Head of Department: Asso.prof. Hend Elsayed Gadow

Date of Approval: 2023

Mass Transfer Operations I
CHE313

1-Basic Information:

Program Title	Chemical Engineering Program
Department Offering the Program	Chemical Engineering Department
Department Responsible for the Course	Chemical Engineering Department
Course Title	Mass Transfer Operations I
Course Code	CHE313
Year/Level	Level 3
Specialization	Major
Authorization Date of Course Specification	-

Teaching hours	Lectures	Exercise	laboratory	Student's load
	2	2	-	4

2-Course Aims:

No.	Aims
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.

3-Intended Learning Outcomes (ILO'S):

Competencies	Learning Outcomes (LO'S)
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 Mass Transfer. **b1.** Summarize the appropriate techniques relevant to mass transfer **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 mass transport Phenomena and the basic equation of change to respond to the challenging role and responsibilities of a professional chemical engineer

4. Course Contents:

No.	Topics	Lecture	Exercise	laboratory	Student load
1	Introduction to mass transfer and diffusion- basic definitions (velocity concentration - flux) - molecular diffusion in gases.	4	4	-	8
2	molecular diffusion in liquids - molecular diffusion in gels and biological solutions	4	4		8
3	molecular diffusion in solids	4	4		8
4	convective mass transfer- types of mass transfer coefficients - dimensionless groups in mass transfer	2	2	-	4
5	theories of mass transfer- momentum, heat, and mass transfer analogies	4	4	-	8
6	equilibrium between two phases- interphase mass transfer- overall mass transfer coefficients.	4	4	-	8
7	Vapor-liquid equilibria (VLE), binary system distillation (plate and packed columns)	4	4	-	8
8	liquid-liquid extraction.	2	2		4
Total		**28**	**28**	**-**	**56**

5. Teaching and learning methods:

No	Topics	Face-to-Face Lecture	Online Lecture	Flipped Classroom	Presentation and movies	Discussion	Problem solving	Brain storming	Projects	Site visits	Self-learning and Research	Cooperative	Discovering	Modeling	lab
1	Introduction to mass transfer and diffusion- basic definitions (velocity concentration - flux) - molecular diffusion in gases.	x	x			x					x				
2	molecular diffusion in liquids - molecular diffusion in gels and biological solutions	x	x			x	x								
3	molecular diffusion in solids	x	x			x		x							
4	convective mass transfer- types of mass transfer coefficients - dimensionless groups in mass transfer	x	x			x	x								
5	theories of mass transfer- momentum, heat, and mass transfer analogies	x	x			x	x								

6	equilibrium between two phases- interphase mass transfer- overall mass transfer coefficients.	x	x			x	x	x							
7	Vapor-liquid equilibria (VLE), binary system distillation (plate and packed columns)	x	x			x	x	x							
8	liquid-liquid extraction.	x	x			x	x	x							

6. **Teaching and learning methods for disable students:**

No.	Teaching Methods	Reason
1	Presentation of the course in digital material	Better access any time
2	Web communication with students	Better communication with certain cases
3	Asking small groups to do assignments; each composed of low ,medium and high performance students	Knowledge and skills transfer among different levels of students

7. **Student evaluation:**

7.1 Student evaluation method:

No.	Evaluation Method	Competencies	LO’s
1	Periodic exams	B1	a1
2	Semester work (sheets, quizzes, presentation)	B1/B2	c1/d1
3	Final term examination	B1/B2	a1,b1/d1

7.2 Evaluation Schedule:

No.	Evaluation Method	Weeks
1	Periodic exams	8^{th}
2	Student load	2^{nd} -7^{th} - 9^{th} -14^{th}
3	Final term examination	15^{th}

7.3 weighting of Evaluation:

No.	Evaluation method	Marks
1	Periodic exams	30
2	Student load	20
3	Final term examination	75
Total		125

8. List of References:

No.	Reference List
1	CENGEL "Heat and Mass Transfer" MC GRAW HILL INDIA; 6th edition, (2019).
2	FRANK P. INCROPERA P. DEWITT "Incroperas Principles Of Heat And Mass Transfer " WILEY INDIA; , (2018).
3	Theodore L. Bergman, Adrienne S. Lavine, Frank P. Incropera, David P. DeWitt "Fundamentals of Heat and Mass Transfer" WILEY; 8th edition, (2018).

9. Facilities required for teaching and learning:

No.	Facility	No.	Facility
1	Lecture classroom	4	Data show system
2	Presenter	5	Sound system
3	White board		

10. Matrix of Competencies and LO’s of the course:

No.	Topic	Aims	Competencies	LO’s
1	Introduction to mass transfer and diffusion- basic definitions (velocity concentration - flux) - molecular diffusion in gases.	4	B1	a1
2	molecular diffusion in liquids - molecular diffusion in gels and biological solutions	4	B2	d1
3	molecular diffusion in solids	4	B1	a1
4	convective mass transfer- types of mass transfer coefficients - dimensionless groups in mass transfer	4	B1	a1
5	theories of mass transfer- momentum, heat, and mass transfer analogies	4	B1	b1,c1

6	equilibrium between two phases- interphase mass transfer- overall mass transfer coefficients.	4	B1	b1,c1
7	Vapor-liquid equilibria (VLE), binary system distillation (plate and packed columns)	4	B1	b1,c1
8	liquid-liquid extraction.	4	B2	d1

Course Coordinator: Dr. / Riham Atef

Head of Department: Asso.prof. Hend Elsayed Gadow

Date of Approval: 2023

Biochemistry

CHE314

1-Basic Information:

Program Title	Chemical Engineering Program
Department Offering the Program	Chemical Engineering Department
Department Responsible for the Course	Chemical Engineering Department
Course Title	Bio Organic Chemistry
Course Code	CHE314
Year/Level	Level 3
Specialization	Major
Authorization Date of Course Specification	-

Teaching hours	Lectures	Exercise	laboratory	Student's load
	2	2	-	4

2-Course Aims:

No.	Aims
1	Master a broad range of organic chemistry engineering knowledge and specialized skills, as well as the ability to apply acquired knowledge in real-world situations by applying theories in organic critical and systemic thinking to identify, diagnose, and solve engineering problems of varying complexity and variation.
8	Consider the impact of bioorganic chemical process industries on society, economics, and the environment using fundamental knowledge of chemical process industries.

3- Competencies:

Competencies	Learning Outcomes (LO'S)
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,	**a1.**Recognize the bioorganic compounds that utilize a full range of thermodynamics and kinetics of chemical reactions. **b1.** Design new processes or products through utilization bioorganic chemical reactions.

Instrumentation and Control of Chemical Processes, and Process and Plant Design.	
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 bioorganic 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.
A4. Utilize contemporary technologies, codes of practice and standards, quality guidelines, health and safety requirements, environmental issues and risk management principles.	**a3**. Define contemporary engineering technologies and their applications in relation to disciplines.
A5. Practice research techniques and methods of investigation as an inherent part of learning.	**b1**. Assess different ideas, views, and knowledge from a range of sources. **d1**. Search for information to engage in lifelong self-learning discipline.

4. **Course Contents:**

No.	Topics	Lecture	Exercise	laboratory	Student load
1	Principles	4	4	-	8
2	Carbohydrates	4	4	-	8
3	amino acids	4	4	-	8
4	proteins	4	4	-	8
5	Enzymes	2	2		4
6	fatty acids	2	2	-	4
7	oils and fats	4	4	-	8
8	Pharmaceutical compounds.	4	4	-	8
Total		**28**	**28**	**-**	**56**

5. **Teaching and learning methods:**

No	Topics	Face-to-Face Lecture	Online Lecture	Flipped Classroom	Presentation and movies	Discussion	Problem solving	Brain storming	Projects	Site visits	Self-learning and Research	Cooperative	Discovering	Modeling	lab
1	Principles of bio chemistry	x	x			x					x				
2	Carbohydrates	x	x			x									
3	Amino acids	x	x			x	x				x				
4	Proteins	x	x			x	x								
5	Enzymes	x	x			x					x				
6	Fatty acids	x	x			x	x								
7	Oils and fats	x	x			x	x								
8	Pharmaceutical compounds	x	x			x	x				x				

6. Teaching and learning methods for disable students:

No.	Teaching Methods	Reason
1	Presentation of the course in digital material	Better access any time
2	Web communication with students	Better communication with certain cases
3	Asking small groups to do assignments; each composed of low ,medium and high performance students	Knowledge and skills transfer among different levels of students

7. Student evaluation:

7.1 Student Evaluation Method:

No.	Evaluation Method	Competencies	LO's
1	Periodic exams	B1	a1,b1
2	Semester work (sheets, quizzes)	A5	b1,d1
3	Final term examination	A2,A4/B1	a1,a3/a1

7.2 Evaluation Schedule:

No.	Evaluation Method	Weeks
1	Periodic exams	8th
2	Student load	2nd -7th - 9th-14th
3	Final term examination	15th

7.3 weighting of Evaluation:

No.	Evaluation method	Marks
1	Periodic exams	20
2	Student load	30
3	Final term examination	50
Total		**100**

8. List of References:

No.	Reference List
1	Dean Appling,Spencer Anthony-Cahill,Christopher Mathews"Biochemistry: Concepts and Connections" Pearson; 2nd edition (2018)
2	Victor W. Rodwell, David A. Bender, Kathleen M. Botham, Peter J. Kennelly, P. Anthony Weil "Harper's Illustrated Biochemistry, 31e, (2018)

9. Facilities required for teaching and learning:

No.	Facility	No.	Facility
1	Lecture classroom	4	Data show system
2	Presenter	5	Sound system
3	White board		

10. Matrix of Competencies and LO's of the course:

No.	Topic	Aims	Competencies	LO's
1	Principles of bio chemistry	1	A2/A5	a1/b1
2	Carbohydrates	1	A2/A5	a1/d1
3	Amino acids	1	A2	a1
4	Proteins	1	A2	a1
5	Enzymes	1	B1	a1
6	Fatty acids	1	B1	a1
7	Oils and fats	8	A4/B1	a3/b1
8	Pharmaceutical compounds	8	A4/B1	a3/b1

Course Coordinator: Asso.prof. Khaled Samir

Head of Department: Asso.prof. Hend Elsayed Gadow

Date of Approval: 2023

Electrochemistry
CHE315

1-Basic Information:

Program Title	Chemical Engineering Program
Department Offering the Program	Chemical Engineering Department
Department Responsible for the Course	Chemical Engineering Department
Course Title	Electrochemistry
Course Code	CHE315
Year/Level	Level 3
Specialization	Major
Authorization Date of Course Specification	-

Teaching hours	**Lectures**	**Exercise**	**laboratory**	**Student's load**
	2	1	1	3

2-Course Aims:

No.	**Aims**
4	Use the techniques and skills related to electrochemistry required for engineering practice by taking full responsibility for the learning and development of the individual, and participating in lifelong learning.
6	Analyze data from the intended electrochemistry tests to manage resources creatively.

3- Competencies:

Competencies	**Learning Outcomes (LO'S)**
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** Professionally merge the engineering knowledge, understanding, and feedback to improve design, products and/or services related to electrochemistry
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 electrochemistry to respond to the challenging role and responsibilities of a professional chemical engineer

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 electrochemistry systems.

4. Course Contents:

No.	Topics	Lecture	Exercise	laboratory	Student load
1	Chemistry and electricity [Electro neutrality - Potential differences at interfaces]	4	2	2	6
2	Electrochemical cells [Transport of charge within the cell-Cell description conventions -Electrodes and electrode reactions]	2	3	3	9
3	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]	2	3	3	9
4	The Nernst equation -Concentration cells-Analytical applications of the Nernst equation	4	1	1	3
5	Determination of solubility products-Potentiometric titrations -Measurement of pH -Membrane potentials	4	2	2	6
6	Batteries and fuel cells [The fuel cell]	4	2	2	6
7	Electrochemical Corrosion [Control of corrosion]- Electrolytic cells [Electrolysis involving water - Faraday's laws of electrolysis-]	8	1	1	3
Total		**28**	**14**	**14**	**42**

5. Teaching and learning methods:

No	Topics	Face-to-Face Lecture	Online Lecture	Flipped Classroom	Presentation and movies	Discussion	Problem solving	Brain storming	Projects	Site visits	Self-learning and Research	Cooperative	Discovering	Modeling	lab
1	Chemistry and electricity [Electro neutrality - Potential differences at interfaces]	x	x	x		x	x								x
2	Electrochemical cells [Transport of charge within the cell-Cell description conventions Electrodes and electrode reactions]	x	x			x	x	x							x
3	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]	x	x			x	x				x				x

4	The Nernst equation Concentration cells- Analytical applications of the Nernst equation	x	x	x		x									x
5	Determination of solubility products- Potentiometric	x	x			x	x								x
	titrations - Measurement of pH Membrane potentials														
6	Batteries and fuel cells [The fuel cell]	x	x	x							x				x
7	Electrochemical Corrosion [Control of corrosion]- Electrolytic cells [Electrolysis involving water - Faraday's laws of electrolysis-]	x	x			x	x								x

6. Teaching and learning methods for disable students:

No.	Teaching Methods	Reason
1	Presentation of the course in digital material	Better access any time
2	Web communication with students	Better communication with certain cases
3	Asking small groups to do assignments; each composed of low ,medium and high performance students	Knowledge and skills transfer among different levels of students

7. Student evaluation:

7.1 Student evaluation method:

No.	Evaluation Method	Competencies	LO's
1	Periodic exams	A10/B2	d1/d1
2	Semester work(sheets, quizzes ,presentation)	B2/A10/B4	d1/d2/ d1

3	Final term examination	B2/A10/B4	d1/d2/d1

7.2 Evaluation Schedule:

No.	Evaluation Method	Weeks
1	Periodic exams	8th
2	Student load	2nd -7th - 9th-14th
3	Final term examination	15th

7.3 weighting of Evaluation:

No.	Evaluation Method	Marks
1	Periodic exams	20
2	Student load	30
3	Final term examination	50
Total		**100**

8. List of References:

No.	Reference List
1	Pietro Pedeferri "Corrosion Science and Engineering" Springer, (2018).
2	Toshiaki Ohtsuka, Atsushi Nishikata, Masatoshi Sakairi, Koji Fushimi "Electrochemistry for Corrosion Fundamentals" Springer ; 1st edition, (2018).
3	Atkins, P. W., Physical Chemistry, Oxford University Press, 11th. Ed., 2018.
4	César A. C. Sequeira "High Temperature Corrosion: Fundamentals and Engineering (Wiley Series in Corrosion)" John Wiley and Sons; 1st edition, (2018).

9. Facilities required for teaching and learning:

No.	Facility	No.	Facility
1	Lecture classroom	4	Data show system
2	Presenter	5	Sound system
3	White board		

10. Matrix of Competencies and LO's of the course:

No.	Topic	Aims	Competencies	LO's
1	Chemistry and electricity [Electro neutrality - Potential differences at interfaces]	4,6	A10	d1
2	Electrochemical cells [Transport of charge within the cell-Cell description conventions - Electrodes and electrode reactions]	4,6	B4	d1
3	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]	4,6	B2	d1
4	The Nernst equation -Concentration cells- Analytical applications of the Nernst equation	4,6	A10	d2
5	Determination of solubility products- Potentiometric titrations -Measurement of pH -Membrane potentials	4,6	A10	d2
6	Batteries and fuel cells [The fuel cell]	4,6	B4	d1
7	Electrochemical Corrosion [Control of corrosion]- Electrolytic cells [Electrolysis involving water - Faraday's laws of electrolysis-]	4,6	B2	d1

Course Coordinator: Asso.prof. Hend Elsayed Gadow

Head of Department: Asso.prof. Hend Elsayed Gadow

Date of Approval: 2023

Liquefied Natural Gas
CHE316A

1-Basic Information:

Program Title	Chemical Engineering Program
Department Offering the Program	Chemical Engineering Department
Department Responsible for the Course	Chemical Engineering Department
Course Title	Liquefied Natural Gas
Course Code	CHE316A
Year/Level	Level 3
Specialization	Major
Authorization Date of Course Specification	-

Teaching hours	Lectures	Exercise	laboratory	Student's load
	2	2	-	3

2-Course Aims:

No.	Aims
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.

3- Competencies:

Competencies	Learning Outcomes (LO'S)
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 processes . **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.

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**. Effectively manage tasks, time, and resources. **d3.** Refer to relevant literatures.
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 recent technical advancements and developing disciplines related to liquefied natural gas in order to respond to the demanding role and obligations of a professional chemical engineer.

4. Course Contents:

No.	Topics	Lecture	Exercise	laboratory	Student load
1	Refrigeration systems	4	4	-	6
2	Natural gas preparation and liquefaction	6	6	-	9
3	Thermodynamic aspects of liquefaction	4	4	-	6
4	liquefaction plants	6	6	-	9
5	Properties of LNG	4	4	-	6
6	Vaporization losses and custody transfer.	4	4	-	6
Total		**28**	**28**	-	**42**

5. Teaching and learning methods:

No	Topics	Face-to-Face Lecture	Online Lecture	Flipped Classroom	Presentation and movies	Discussion	Problem solving	Brain storming	Projects	Site visits	Self-learning and Research	Cooperative	Discovering	Modeling	lab
1	Refrigeration systems	x	x			x					x				

2	Natural gas preparation and liquefaction	**x**	**x**			**x**	**x**								
3	thermodynamic aspects of liquefaction	**x**	**x**			**x**	**x**								
4	liquefaction plants	**x**	**x**			**x**	**x**				**x**				
5	Properties of LNG	**x**	**x**			**x**	**x**								
6	Vaporization losses and custody transfer.	**x**	**x**			**x**		**x**			**x**				

6. Teaching and learning methods for disable students:

No.	Teaching Methods	Reason
1	Presentation of the course in digital material	Better access any time
2	Web communication with students	Better communication with certain cases
3	Asking small groups to do assignments; each composed of low ,medium and high performance students	Knowledge and skills transfer among different levels of students

7. Student evaluation:

7.1 Student Evaluation Method:

No.	Evaluation Method	Competencies	LO’s
1	Periodic exams	A9	d1,d2
2	Semester work (sheets, quizs, reports)	A9/A3	d1,d2,d3/c1
3	Final term examination	A3 /B2	a1,b1/d1

7.2 Evaluation Schedule:

No.	Evaluation Method	Weeks
1	Periodic exams	8^{th}
2	Student load	2^{nd} -7^{th} - 9^{th} -14^{th}
3	Final term examination	15^{th}

7.3 weighting of Evaluation:

No.	evaluation method	Marks
1	Periodic exams	30
2	Student load	20

3	Final term examination	50
Total		**100**

8. List of References:

No.	Reference List
1	James G. Speight "Natural Gas: A Basic Handbook" Gulf Professional Publishing; 2nd edition, (2018).
2	Arthur J. Kidnay, William R. Parrish, Daniel G. McCartney "Fundamentals of Natural Gas Processing" CRC Press ; 3rd edition, (2020).
3	Saeid Mokhatab, William Poe, John Mak "Handbook of Natural Gas Transmission and Processing Principles and Practices" Gulf Professional Publishing; 4th Edition, (2019).

9. Facilities required for teaching and learning:

No.	Facility	No.	Facility
1	Lecture classroom	4	Data show system
2	Presenter	5	Sound system
3	White board		

10. Matrix of Competencies and LO’s of the course:

No.	Topic	Aims	Competencies	LO’s
1	Refrigeration systems	9	A9	d3
2	Natural gas preparation and liquefaction	9	B2	d1
3	thermodynamic aspects of liquefaction	8,9	A9	d1,d2
4	liquefaction plants	8,9	A3	b1,c1
5	Properties of LNG	9	A3	a1
6	Vaporization losses and custody transfer.	8,9	A3	b1

Course Coordinator: Dr. Riham Atef

Head of Department: Asso.prof. Hend Elsayed Gadow

Date of Approval: 2023

Gas Sweetening
CHE316B

1-Basic Information:

Program Title	Chemical Engineering Program
Department Offering the Program	Chemical Engineering Department
Department Responsible for the Course	Chemical Engineering Department
Course Title	Gas Sweetening
Course Code	CHE316B
Year/Level	Level 4
Specialization	Major
Authorization Date of Course Specification	-

Teaching hours	Lectures	Exercise	laboratory	Student's load
	2	2	-	3

2-Course Aims:

No.	Aims
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.

3- Competencies:

Competencies	Learning Outcomes (LO'S)
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 processes . **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.

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** Effectively manage tasks, time, and resources. **d3** Refer to relevant literatures.
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 recent technical advancements and developing disciplines related to gas sweetening in order to respond to the demanding role and obligations of a professional chemical engineer.

4. Course Contents:

No.	Topics	Lecture	Exercise	laboratory	Student load
1	Characterization and properties of natural gas systems	2	2	-	6
2	Product specification	4	4	-	6
3	Natural gas phase behavior	2	2	-	3
4	Oil and gas separation technology	4	4	-	6
5	Classification and common features of separators	4	4	-	4
6	Natural gas dehydration and natural gas sweetening	2	2	-	3
7	Refrigeration systems and liquefaction	2	2	-	3
8	thermodynamic aspects of liquefaction	2	2		4
9	liquefaction plants	4	4		3
10	Properties of LNG	2	2		4
Total		**28**	**28**	**-**	**42**

5. Teaching and learning methods:

No	Topics	Face-to-Face Lecture	Online Lecture	Flipped Classroom	Presentation and movies	Discussion	Problem solving	Brain storming	Projects	Site visits	Self-learning and Research	Cooperative	Discovering	Modeling	lab
1	Characterization and properties of natural gas systems	x	x			x									
2	Product specification	x	x			x									
3	Natural gas phase behavior	x	x			x					x				
4	Oil and gas separation technology	x	x	x		x					x				
5	Classification and common features of separators	x	x			x									
6	Natural gas dehydration and natural gas sweetening	x	x	x		x					x				
7	Refrigeration systems and liquefaction	x	x			x					x				
8	thermodynamic aspects of liquefaction	x	x			x									
9	liquefaction plants	x	x	x		x					x				
10	Properties of LNG	x	x			x					x				

6. **Teaching and learning methods for disable students:**

No.	Teaching Methods	Reason
1	Presentation of the course in digital material	Better access any time
2	Web communication with students	Better communication with certain cases
3	Asking small groups to do assignments; each composed of low ,medium and high performance students	Knowledge and skills transfer among different levels of students

7. **Student evaluation:**

7.1 Student evaluation method:

No.	Evaluation Method	Competencies	LO's
1	Periodic exams	A9	d1,d2
2	Semester work (sheets, quizzes, presentation)	A9/A3	d1,d2,d3/c1
3	Final term examination	A3 /B2	a1,b1/d1

7.2 Evaluation Schedule:

No.	Evaluation Method	Weeks
1	Periodic exams	Any week
2	Student load	All weeks
3	Final term examination	15^{th}

7.3 weighting of Evaluation:

No.	Evaluation method	Marks
1	Periodic exams	30
2	Student load	20
3	Final term examination	50
Total		**100**

8. **List of References:**

No.	Reference List
1	James G. Speight "Natural Gas: A Basic Handbook" Gulf Professional Publishing; 2nd edition, (2018).
2	Arthur J. Kidnay, William R. Parrish, Daniel G. McCartney "Fundamentals of Natural Gas Processing" CRC Press ; 3rd edition, (2020).
3	Saeid Mokhatab, William Poe, John Mak "Handbook of Natural Gas Transmission and Processing Principles and Practices" Gulf Professional Publishing; 4th Edition, (2019).

9. **Facilities required for teaching and learning:**

No.	Facility	No.	Facility
1	Lecture classroom	4	Data show system

2	Presenter	5	Sound system
3	White board		

10. Matrix of Competencies and LO's of the course:

No.	Topic	Aims	**Competencies**	**LO's**
1	Characterization and properties of natural gas systems	8	A3	b1,c1
2	Product specification	8,9	B2	d1
3	Natural gas phase behavior	8,9	B2	d1
4	Oil and gas separation technology	8,9	A9	d1,d2
5	Classification and common features of separators	8,9	B2	d1
6	Natural gas dehydration and natural gas sweetening	8,9	B2	d1
7	Refrigeration systems and liquefaction	8,9	A3	a1, b1,c1
8	thermodynamic aspects of liquefaction	8	A9	d3
9	liquefaction plants	8,9	B2	d1
10	Properties of LNG	8,9	B2,A9	d1,d2,d3

Course Coordinator: Dr. / Riham Atef
Head of Department: Asso.prof. Hend Elsayed Gadow
Date of Approval: 2023

Gas Engineering

CHE316C

1-Basic Information:

Program Title	Chemical Engineering Program
Department Offering the Program	Chemical Engineering Department
Department Responsible for the Course	Chemical Engineering Department
Course Title	Gas Engineering
Course Code	CHE316C
Year/Level	Level 3
Specialization	Major
Authorization Date of Course Specification	-

Teaching hours	**Lectures**	**Exercise**	**laboratory**	**Student's load**
	2	2	-	3

2-Course Aims:

No.	Aims
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.

3-Competencies:

Competencies	Learning Outcomes (LO'S)
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 processes . **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.
A9. Use creative, innovative and flexible thinking and acquire entrepreneurial and	**d1**. Think creatively in solving problems of design.

leadership skills to anticipate and respond to new situations.	**d2**. Effectively manage tasks, time, and resources. **d3**. Refer to relevant literatures.
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 recent technical advancements and developing disciplines related to gas engineering in order to respond to the demanding role and obligations of a professional chemical engineer.

4. Course Contents:

No.	Topics	Lecture	Exercise	laboratory	Student load
1	Natural gas origins and accumulations- conventional and unconventional natural gas resources- natural gas composition.	6	6	-	6
2	gas hydrates and their prevention- phase behavior of well fluids-	4	4	-	8
3	natural gas properties- principal products- product specification and combustion characteristics	4	4	-	6
4	exploration, drilling, and well completion	4	4	-	8
5	natural gas production- natural gas processing (gas-liquid separation, natural gas dehydration, and natural gas sweetening)	6	6	-	6
6	natural gas liquefaction, transportation, and storage.	4	4	-	8
Total		**28**	**28**	-	**42**

5. Teaching and learning methods:

No	Topics	Face-to-Face Lecture	Online Lecture	Flipped Classroom	Presentation and movies	Discussion	Problem solving	Brain storming	Projects	Site visits	Self-learning and Research	Cooperative	Discovering	Modeling	lab
1	Natural gas origins and accumulations-conventional and unconventional natural gas resources-natural gas composition.	x	x			x									
2	gas hydrates and their prevention-phase behavior of well fluids-	x	x			x	x								
3	natural gas properties-principal products-product specification and combustion characteristics	x	x			x					x				
4	exploration, drilling, and	x	x			x	x								

	well completion														
5	natural gas production-natural gas processing (gasliquid separation, natural gas dehydration, and natural gas sweetening)	**x**	**x**			**x**		**x**			**x**				
6	natural gas liquefaction, transportation, and storage.	**x**	**x**			**x**	**x**								

6. Teaching and learning methods for disable students:

No.	Teaching Methods	Reason
1	Presentation of the course in digital material	Better access any time
2	Web communication with students	Better communication with certain cases
3	Asking small groups to do assignments; each composed of low ,medium and high performance students	Knowledge and skills transfer among different levels of students

7. Student evaluation:

7.1 Student Evaluation Method:

No.	Evaluation Method	Competencies	LO's
1	Periodic exams	A9	d1,d2
2	Semester work (sheets, quizs, reports)	A9/A3	d1,d2,d3/c1
3	Final term examination	A3 /B2	a1,b1/d1

7.2 Evaluation Schedule:

No.	Evaluation Method	Weeks
1	Periodic exams	Any week
2	Student load	All weeks
3	Final term examination	15th

7.3 weighting of Evaluation:

No.	Evaluation method	Marks
1	Periodic exams	30
2	Student load	20
3	Final term examination	50
Total		**100**

8. List of References:

No.	Reference List
1	James G. Speight "Natural Gas: A Basic Handbook" Gulf Professional Publishing; 2nd edition, (2018).
2	Arthur J. Kidnay, William R. Parrish, Daniel G. McCartney "Fundamentals of Natural Gas Processing" CRC Press ; 3rd edition, (2020).
3	Saeid Mokhatab, William Poe, John Mak "Handbook of Natural Gas Transmission and Processing Principles and Practices" Gulf Professional Publishing; 4th Edition, (2019).

9. Facilities required for teaching and learning:

No.	Facility	No.	Facility
1	Lecture classroom	4	Data show system
2	Presenter	5	Sound system
3	White board		

10. Matrix of Competencies and LO's of the course:

No.	Topic	Aims	Competencies	LO's
1	Natural gas origins and accumulations- conventional and unconventional natural gas resources- natural gas composition.	9,8	A9	d3

2	gas hydrates and their prevention- phase behavior of well fluids-	9,8	A3	a1
3	natural gas properties- principal products- product specification and combustion characteristics	9,8	A3	b1
4	exploration, drilling, and well completion	9	A3	c1
5	natural gas production- natural gas processing (gas-liquid separation, natural gas dehydration, and natural gas sweetening)	9,8	B2	d1
6	natural gas liquefaction, transportation, and storage.	9	A9	d1,d2

Course Coordinator: Dr. / Riham Atef
Head of Department: Asso.prof. Hend Elsayed Gadow
Date of Approval: 2023

Introduction to combustion Phenomena

CHE316D

1-Basic Information:

Program Title	Chemical EngineeringProgram
Department Offering the Program	Chemical Engineering Department
Department Responsible for the Course	Chemical Engineering Department
Course Title	Introduction to combustion Phenomena
Course Code	CHE316D
Year/Level	Level 3
Specialization	Major
Authorization Date of Course Specification	-

Teaching hours	**Lectures**	**Exercise**	**laboratory**	**Student's load**
	2	2	-	3

2-Course Aims:

No.	**Aims**
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.

3- Competencies:

Competencies	**Learning Outcomes (LO'S)**
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 processes . **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.

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** Effectively manage tasks, time, and resources. **d3** Refer to relevant literatures.
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 recent technical advancements and developing disciplines related to combustion Phenomena in order to respond to the demanding role and obligations of a professional chemical engineer.

4. Course Contents:

No.	Topics	Lecture	Exercise	laboratory	Student load
1	Develops a foundation in combustion phenomena including transport and other mechanisms in homogeneous and heterogeneous combustion.	6	6	-	9
2	Environmental implications of combustion.	4	4	-	8
3	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.	10	10	-	15
4	Regulatory concerns, stoichiometry, thermo chemistry, incinerators and air pollution control.	8	8	-	10
Total		**28**	**28**	**-**	**42**

5. Teaching and learning methods:

No	Topics	Face-to-Face Lecture	Online Lecture	Flipped Classroom	Presentation and movies	Discussion	Problem solving	Brain storming	Projects	Site visits	Self-learning and Research	Cooperative	Discovering	Modeling	lab
1	Develops a foundation in combustion phenomena including transport and other mechanisms in homogeneous and heterogeneous combustion...	x	x	x	x	x					x				
2	Environmental implications of combustion	x	x		x	x					x				
3	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	x	x			x	x	x							

4	Regulatory concerns, stoichiometry, thermo chemistry, incinerators and air pollution control	x	x			x					x				

6. Teaching and learning methods for disable students:

No.	Teaching Methods	Reason
1	Presentation of the course in digital material	Better access any time
2	Web communication with students	Better communication with certain cases
3	Asking small groups to do assignments; each composed of low ,medium and high performance students	Knowledge and skills transfer among different levels of students

7. Student evaluation:

7.1 Student evaluation method:

No.	Evaluation Method	Competencies	LO's
1	Periodic exams	A9	d1,d2
2	Semester work (sheets, quizzes, presentation)	A9/A3	d1,d2,d3/c1
3	Final term examination	A3 /B2	a1,b1/d1

7.2 Evaluation Schedule:

No.	Evaluation Method	Weeks
1	Periodic exams	8^{th}
2	Student load	2^{nd} -7^{th} - 9^{th}-14^{th}
3	Final term examination	15^{th}

7.3 weighting of Evaluation:

No.	Evaluation method	Marks
1	Periodic exams	30
2	Student load	20

3	Final term examination	50
Total		**100**

8. List of References:

No.	Reference List
1	Jeff Kuo "Air Pollution Control Engineering for Environmental Engineers" CRC Press; 1st edition, (2019).
2	Joseph S. Devinny "Biofiltration for Air Pollution Control" CRC Press; 1st edition, (2017).
3	Paul N. Cheremisinoff "Air Pollution Control and Design for Industry" Routledge; 1st edition, (2018).
4	Pallavi Saxena "Air Pollution: Sources, Impacts and Controls" CABI; , (2018).

9. Facilities required for teaching and learning:

No.	Facility	No.	Facility
1	Lecture classroom	4	Data show system
2	Presenter	5	Sound system
3	White board		

10. Matrix of Competencies and LO’s of the course:

No.	Topic	Aims	Competencies	LO’s
1	Develops a foundation in combustion phenomena including transport and other mechanisms in homogeneous and heterogeneous combustion.	8,9	A3	a1,b1
2	Environmental implications of combustion	8	A9/B2	d1,d2/d1

3	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	8,9	B2	d1
4	Regulatory concerns, stoichiometry, thermo chemistry, incinerators and air pollution control	8	A3,A9	a1, c1,d1,d3

Course Coordinator: prof. Dr. Taha Farrag

Head of Department: Asso.prof. Hend Elsayed Gadow

Date of Approval: 2023

Air Pollution

CHE316E

4-Basic Information:

Program Title	Chemical Engineering Program
Department Offering the Program	Chemical Engineering Department
Department Responsible for the Course	Chemical Engineering Department
Course Title	Air Pollution
Course Code	CHE316E
Year/Level	Level 3
Specialization	Major
Authorization Date of Course Specification	-

Teaching hours	**Lectures**	**Exercise**	**laboratory**	**Student's load**
	2	2	-	3

2-Course Aims:

No.	**Aims**
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.

3- - Competencies:

Competencies	**Learning Outcomes (LO'S)**
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 processes . **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.

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** Effectively manage tasks, time, and resources. **d3** Refer to relevant literatures.
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 recent technical advancements and developing disciplines related to air pollution in order to respond to the demanding role and obligations of a professional chemical engineer.

4. Course Contents:

No.	Topics	Lecture	Exercise	laboratory	Student load
1	Source of pollutants	4	4	-	6
2	measurements and equipment design for removal of air pollutants	4	4	-	6
3	Effects of air pollutants	4	4	-	6
4	Dispersion of pollutants in the atmosphere	4	4	-	6
5	Particulate matter and its control equipment	4	4	-	6
6	Atmospheric photochemical reactions	4	4	-	6
7	Instrumentation and emission testing equipment	4	4		6
Total		**28**	**28**	-	**42**

5. Teaching and learning methods:

No	Topics	Face-to-Face Lecture	Online Lecture	Flipped Classroom	Presentation and movies	Discussion	Problem solving	Brain storming	Projects	Site visits	Self-learning and Research	Cooperative	Discovering	Modeling	lab
1	Source of pollutants	x	x	x		x									
2	measurements and equipment design for removal of air	x	x			x	x				x				
	pollutants														
3	Effects of air pollutants	x	x			x					x				
4	Dispersion of pollutants in the atmosphere	x	x	x		x									
5	Particulate matter and its control equipment	x	x			x					x				
6	Atmospheric photochemical reactions	x	x			x									
7	Instrumentation and emission testing equipment	x	x			x					x				

6. Teaching and learning methods for disable students:

No.	Teaching Methods	Reason
1	Presentation of the course in digital material	Better access any time
2	Web communication with students	Better communication with certain cases

3	Asking small groups to do assignments; each composed of low ,medium and high performance students	Knowledge and skills transfer among different levels of students

7. Student evaluation:

7.1 Student Evaluation Method:

No.	Evaluation Method	Competencies	LO's
1	Periodic exams	A9	d1,d2
2	Semester work (sheets, quizs, reports)	A9/A3	d1,d2,d3/c1
3	Final term examination	A3 /B2	a1,b1/d1

7.2 Evaluation Schedule:

No.	Evaluation Method	Weeks
1	Periodic exams	8th
2	Student load	2nd -7th - 9th -14th
3	Final term examination	15th

7.3 weighting of Evaluation:

No.	evaluation method	Marks
1	Periodic exams	30
2	Student load	20
3	Final term examination	50
Total		**100**

8. List of References:

No.	Reference List
1	Measurement, Modeling and Mitigation, Fourth Edition By Abhishek Tiwary, Ian Williams Copyright Year 2019
2	Atmospheric Chemistry and Physics: From Air Pollution to Climate Change by Spyros N. Pandis and John H. Seinfeld | Apr 4, 2016
3	M. Khare, Air Pollution - Monitoring, Health and Control, Intech, 2012.

9. Facilities required for teaching and learning:

No.	Facility	No.	Facility
1	Lecture classroom	4	Data show system
2	Presenter	5	Sound system

3	White board

10. Matrix of Competencies and LO's of the course:

No.	Topic	Aims	Competencies	LO's
1	Source of pollutants	8	A9	d3
2	measurements and equipment design for removal of air pollutants	9	A3	a1
3	Effects of air pollutants	8	A9	d3
4	Dispersion of pollutants in the atmosphere	8	A9	d3
5	Particulate matter and its control equipment	9	A9,A3	d1,b1
6	Atmospheric photochemical reactions	8	B2	d1
7	Instrumentation and emission testing equipment	9	A9,A3	d2,c1

Course Coordinator: Dr. Mohamed Elbindary

Head of Department: Asso.prof. Hend Elsayed Gadow

Date of Approval: 2023

Engineering Materials Selection
CHE316F

1-Basic Information:

Program Title	Chemical Engineering Program
Department Offering the Program	Chemical Engineering Department
Department Responsible for the Course	Chemical Engineering Department
Course Title	Engineering Materials Selection
Course Code	CHE316F
Year/Level	Level3
Specialization	Major
Authorization Date of Course Specification	-

Teaching hours	Lectures	Exercise	laboratory	Student's load
	2	2	-	3

2-Course Aims:

No.	Aims
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.

3- Competencies:

Competencies	Learning Outcomes (LO'S)
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 processes . **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.

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.** Effectively manage tasks, time, and resources. **d3.** Refer to relevant literatures.
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 recent technical advancements and developing disciplines related to alloys and metals in order to respond to the demanding role and obligations of a professional chemical engineer.

4. Course Contents:

No.	Topics	Lecture	Exercise	laboratory	Student load
1	Introduction on the application of Engineering of materials science principles	4	4	-	6
2	The application of Engineering of materials science principles on the metals	4	4	-	6
3	The application of Engineering of materials science principles on the ceramics	4	4		6
4	The application of Engineering of materials science principles on the plastic Materials	4	4	-	6
5	Uses of different materials in different application	8	8	-	12
6	Study the corrosion, oxidation, and variation of properties with temperature.	4	4	-	6
Total		**28**	**28**	-	**42**

5. Teaching and learning methods:

No	Topics	Face-to-Face Lecture	Online Lecture	Flipped Classroom	Presentation and movies	Discussion	Problem solving	Brain storming	Projects	Site visits	Self-learning and Research	Cooperative	Discovering	Modeling	lab
1	Introduction on the application of Engineering of materials science principles	x	x	x							x				
2	The application of Engineering of materials science principles on the metals	x	x			x	x								
3	The application of Engineering of materials science principles on the ceramics	x	x			x	x								
4	The application of Engineering of materials science principles on the plastic Materials	x	x			x	x	x							
5	Uses of different materials in different application	x	x			x					x				

6	Study the corrosion, oxidation, and variation of properties with temperature.	x	x			x					x				

6. Teaching and learning methods for disable students:

No.	Teaching Methods	Reason
1	Presentation of the course in digital material	Better access any time
2	Web communication with students	Better communication with certain cases
3	Asking small groups to do assignments; each composed of low ,medium and high performance students	Knowledge and skills transfer among different levels of students

7. Student evaluation:

7.1 Student Evaluation Method:

No.	Evaluation Method	Competencies	LO's
1	Periodic exams	A9	d1,d2
2	Semester work (sheets, quizs, presentation)	A9/A3	d1,d2,d3/c1
3	Final term examination	A3 /B2	a1,b1/d1

7.2 Evaluation Schedule:

No.	Evaluation Method	Weeks
1	Periodic exams	8^{th}
2	Student load	2^{nd} -7^{th} - 9^{th}-14^{th}
3	Final term examination	15^{th}

7.3 weighting of Evaluation:

No.	Evaluation method	Marks
1	Periodic exams	30
2	Student load	20
3	Final term examination	50

Total	100

8. List of References:

No.	Reference List
1	James F. Shackelford, Introduction to Materials Science for Engineers, Prentice Hall, 7th Ed., 2019.

9. Facilities required for teaching and learning:

No.	Facility	No.	Facility
1	Lecture classroom	4	Data show system
2	Presenter	5	Sound system
3	White board		

10. Matrix of Competencies and LO's of the course:

No.	Topic	Aims	Competencies	LO's
1	Introduction on the application of Engineering of materials science principles	8	A3	a1,b1
2	The application of Engineering of materials science principles on the metals	8,9	B2	d1
3	The application of Engineering of materials science principles on the ceramics	8,9	B2/A9	d1/d1,d2,d3
4	The application of Engineering of materials science principles on the plastic materials	8	A3	b1,c1
5	Uses of different materials in different application	8,9	A3	a1,b1,c1
6	Study the corrosion, oxidation, and variation of properties with temperature.	8	A3,B2	a1,c1,d1

Course Coordinator: Asso.prof. Hend Elsayed Gadow

Head of Department: Asso.prof. Hend Elsayed Gadow

Date of Approval: 2023

Project Management and Control
(BAS321)

1-Basic Information:

Program Title	Chemical Engineering Program
Department Offering the Program	Chemical engineering Department
Department Responsible for the Course	Basic science and Engineering Department
Course Title	Project Management and Control
Course Code	BAS321
Year/Level	level 3
Specialization	Major
Authorization Date of Course Specification	-

Teaching hours	Lectures	Exercise	laboratory	Student's load
	2	2	-	4

2-Course Aims:

No.	Aims
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.
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.

3- Competencies:

Competencies	Learning Outcomes (LO'S)
A4. Utilize contemporary technologies, codes of practice and standards, quality guidelines, health and safety requirements, environmental issues and risk management principles.	**a2.** List the engineering-related business and management principles. **b1**.Create methodical project management when dealing with new and advancing technology. **c2.**Use fundamental organizational and project management abilities.

A6. Plan, supervise and monitor implementation of engineering projects, taking into consideration other trades requirements.	**a1.** Recognize business and management principles relevant to engineering; project planning and schedule, network based scheduling, critical path method (CPM), program evaluation and review technique (PERT), Probability aspect of project completion time, Project cost control, Resource allocation and forecasting funds requirements. **b1** Judge engineering decisions considering balanced costs, benefits, time from project cost control and forecasting funds requirements.
A8. Communicate effectively – graphically, verbally and in writing – with a range of audiences using contemporary tools.	**d1** Communicate effectively.

4. Course Contents:

No.	Topics	Lecture	Exercise	laboratory	Student load
1	Introduction to project management.	2	2	-	4
2	Project planning and scheduling.	2	2	-	4
3	Network based scheduling.	2	2	-	4
4	Critical path method.	6	6	-	12
5	Program evaluation& review technique (PERT)	4	4	-	8
6	Probability aspects of project completion time.	2	2	-	4
7	Project cost control.	6	6	-	12
8	Resource allocation	2	2	-	4
9	Forecasting funds requirement	2	2	-	4
Total		**28**	**28**	**-**	**56**

5. Teaching and learning methods:

No	Topics	Face-to-Face Lecture	Online Lecture	Flipped Classroom	Presentation and movies	Discussion	Problem solving	Brain storming	Projects	Site visits	Self-learning and Research	Cooperative	Discovering	Modeling	lab
1	Introduction to project management.	x	x			x		x							
2	Project planning and scheduling.	x	x			x		x							
3	Network based scheduling.	x	x			x	x	x							
4	Critical path method.	x	x			x	x	x							
5	Program evaluation& review technique (PERT)	x	x				x	x							
6	Probability aspects of project completion time.	x	x			x		x							
7	Project cost control.	x	x			x	x	x							
8	Resource allocation	x	x			x		x							
9	Forecasting funds requirement	x	x			x	x	x							

6. Teaching and learning methods for disable students:

No.	Teaching Methods	Reason
1	Presentation of the course in digital material	Better access any time

2	Asking small groups to do assignments; each composed of low, medium, and high performance students.	Knowledge and skills transfer among different level of students.

7. Student evaluation:

7.1 Student evaluation method:

No.	Evaluation Method	Competencies	LO's
1	Periodic exams	A4/A6	a2,b1/a1
2	Semester work(quizzes, sheets, report)	A8/A4	d1/c2
3	Final term examination	A6	a1,b1

7.2 Evaluation Schedule:

No.	Evaluation Method	Weeks
1	Student load	2_{nd}, 3_{rd}, 5_{th},10_{th},12_{th}
2	Periodic exams	8_{th}
3	Final term examination	15_{th}

7.3 weighting of Evaluation:

No.	Evaluation method	Marks
1	Periodic exams	20
2	Student load	20
3	Final-term examination	60
Total		**100**

8. List of References:

No.	Reference List
1	Chris Croft "Project Management QuickStart Guide" ClydeBank Media LLC, (2023).
2	Smith, K.A. 2019. Project management and teamwork. New York: McGraw-Hill.

9. Facilities required for teaching and learning:

No.	Facility
1	Lecture classroom
2	Seminar

3	White board
4	Data Show system

10. Matrix of Competencies and LO's of the course:

No.	Topic	Aims	Competencies	LO's
1	Introduction to project management.	2,5	A4	a2,c2
2	Project planning and scheduling.	2,5	A6	a1
3	Network based scheduling.	2,5	A8	d1
4	Critical path method (CPM).	2,5	A6	a1
5	Program evalucation& review technique (PERT)	2,5	A4	b1,c2
6	Probability aspects of project completion time.	2,5	A6	a1
7	Project cost control.	2,5	A6	b1
8	Resource allocation	2,5	A6	b1
9	Forecasting funds requirement	2,5	A6	b1

Course Coordinator: Dr / Hamdy Abd Elaty
Head of Department: Ass.prof. Amal bahiry
Date of Approval: 2023

Mass Transfer Operations II
CHE321

1-Basic Information:

Program Title	Chemical Engineering Program
Department Offering the Program	Chemical Engineering Department
Department Responsible for the Course	Chemical Engineering Department
Course Title	Mass Transfer Operations II
Course Code	CHE321
Year/Level	Level 3
Specialization	Major
Authorization Date of Course Specification	-

Teaching hours	Lectures	Exercise	laboratory	Student's load
	3	2	-	4

2-Course Aims:

No.	Aims
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.
7	Design a system, component, and process to meet recent technological advancements using computer systems in chemical engineering.

3- Competencies:

Competencies	Learning Outcomes (LO'S)
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.

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.	**b1.** Utilize the principles of chemical engineering and techniques including chemical reaction equilibrium and thermodynamics; mass and energy balance; and transport phenomena to different separation processes. **c1.** Create a process, component or system to carry out specialized engineering designs.

4. Course Contents:

No.	Topics	Lecture	Exercise	laboratory	Student load
1	Inter-phase mass transport	3	2	-	4
2	Continuous two phase mass transport processes	6	4	-	8
3	Gas absorption and stripping	6	4	-	8
4	adsorption	6	4	-	8
5	crystallization	3	2	-	4
6	double-effect evaporation	3	2	-	4
7	Humidification, water cooling, drying.	9	6	-	12
8	Membrane separation technology	6	4	-	8
Total		**42**	**28**		**56**

5. Teaching and learning methods:

No	Topics	Face-to-Face Lecture	Online Lecture	Flipped Classroom	Presentation and movies	Discussion	Problem solving	Brain storming	Projects	Site visits	Self-learning and Research	Cooperative	Discovering	Modeling	lab
1	Inter-phase mass transport	x	x			x	x	x							
2	Continuous two phase mass transport processes	x	x			x	x	x							
3	Gas absorption and stripping	x	x			x	x	x							
4	adsorption	x	x			x	x	x							
5	crystallization	x	x			x	x	x							
6	double-effect evaporation	x	x			x	x	x							
7	Humidification, water cooling, drying.	x	x			x	x	x							
8	Membrane separation technology	x	x			x	x	x							

6. Teaching and learning methods for disable students:

No.	Teaching Methods	Reason
1	Presentation of the course in digital material	Better access any time

2	Web communication with students	Better communication with certain cases
3	Asking small groups to do assignments; each composed of low ,medium and high performance students	Knowledge and skills transfer among different levels of students

7. Student evaluation:

7.1 Student evaluation method:

No.	Evaluation Method	Competencies	LO's
1	Periodic exams	B1	b1
2	Semester work (sheets, quizzes, reports)	A7/B1	d1,d2,d3/c1
3	Final term examination	B1	b1

7.2 Evaluation Schedule:

No.	Evaluation Method	Weeks
1	Periodic exams	8th
2	Student load	2nd -7th - 9th -14th
3	Final term examination	15th

7.3 weighting of Evaluation:

No.	Evaluation method	Marks
1	Periodic exams	30
2	Student load	30
3	Final term examination	90
Total		**150**

8. List of References:

No.	Reference List
1	CENGEL "Heat and Mass Transfer" MC GRAW HILL INDIA; 6th edition, (2019).
2	FRANK P. INCROPERA P. DEWITT "Incroperas Principles Of Heat And Mass Transfer " WILEY INDIA; , (2018).
3	Theodore L. Bergman, Adrienne S. Lavine, Frank P. Incropera, David P. DeWitt "Fundamentals of Heat and Mass Transfer" WILEY; 8th edition, (2018).

9. Facilities required for teaching and learning:

No.	Facility	No.	Facility
1	Lecture classroom	4	Data show system
2	Presenter	5	Sound system
3	White board		

10. Matrix of Competencies and LO's of the course:

No.	Topic	Aims	Competencies	LO's
1	Inter-phase mass transport	4	B1	b1
2	Continuous two phase mass transport processes	4	B1	b1
3	Gas absorption and stripping	4	B1	b1
4	adsorption	4	B1	b1
5	crystallization	4	B1	b1
6	double-effect evaporation	4,7	B1,A7	c1,d1
7	Humidification, water cooling, drying.	4,7	B1,A7	c1,d1,d3
8	Membrane separation technology	4,7	B1,A7	c1,d2

Course Coordinator: Dr. /RihamAtef

Head of Department: Asso.prof. Hend Elsayed Gadow

Date of Approval: 2023

Corrosion Engineering
CHE322

1-Basic Information:

Program Title	Chemical Engineering Program
Department Offering the Program	Chemical Engineering Department
Department Responsible for the Course	Chemical Engineering Department
Course Title	Corrosion Engineering
Course Code	CHE322
Year/Level	Level 3
Specialization	Major
Authorization Date of Course Specification	-

Teaching hours	Lectures	Exercise	laboratory	Student's load
	2	2	-	3

2-Course Aims:

No.	Aims
7	Design a system, component, and process to meet recent technological advancements related to corrosion protection.
8	Consider the impact of chemical process industries on society, economics, and the environment using fundamental knowledge of corrosion engineering in chemical process industries.

3-Competencies:

Competencies	Learning Outcomes (LO'S)
A4. Utilize contemporary technologies, codes of practice and standards, quality guidelines, health and safety requirements, environmental issues and risk management principles.	**b1.** Create methodical approaches when dealing with new and advanced materials intended to prevent corrosion. **c1.** Apply safe systems at work by taking the necessary precautions to manage hazards caused by corroded systems.
	d1. Search for information to engage in lifelong self-learning discipline.

A10. Acquire and apply new knowledge; and practice self, lifelong and other learning strategies.	**d2.** Professionally merge the engineering knowledge, understanding, and feedback to improve design, products and/or services.
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.** Integrate in the recent technological changes and emerging fields relevant to corrosion engineering.
B4. Adopt suitable national and international standards and codes to: design, operate, inspect and maintain chemical engineering systems**.**	**d1.** Engage suitable national and international standards and codes to: design, operate, inspect and maintain systems susceptible to corrosion.

4. Course Contents:

No.	Topics	Lecture	Exercise	laboratory	Student load
1	Theories and principles of corrosion	2	2	-	3
2	Types of corrosion (Localized corrosion, pitting, crevice corrosion , cavitations, stress corrosion cracking and corrosion fatigue)	4	4	-	6
3	metallurgical factors	2	2	-	3
4	welding problems	2	2	-	3
5	material selection	2	2	-	3
6	Inspection and nondestructive testing	4	4	-	6
7	chemical cleaning flue gas attack	2	2	-	3
8	corrosion testing evaluation and simulation	4	4	-	6
9	corrosion prevention ,monitoring, cathode protection and anodic protection	2	2	-	3
10	water treatment for boilers and condensers	4	4	-	6
Total		**28**	**28**	**-**	**42**

5. Teaching and learning methods:

No	Topics	Face-to-Face Lecture	Online Lecture	Flipped Classroom	Presentation and movies	Discussion	Problem solving	Brain storming	Projects	Site visits	Self-learning and Research	Cooperative	Discovering	Modeling	lab
1	Theories and principles of corrosion	x	x			x					x				
2	Types of corrosion (Localized corrosion, pitting, crevice corrosion , cavitations, stress corrosion cracking	x	x	x		x	x								
	and corrosion fatigue)														
3	metallurgical factors	x	x	x		x									
4	welding problems	x	x	x		x		x							
5	material selection	x	x	x		x		x							
6	Inspection and nondestructive testing	x	x	x		x									
7	chemical cleaning flue gas attack	x	x	x		x									
8	corrosion testing evaluation and simulation	x	x	x		x	x								
9	corrosion prevention ,monitoring, cathode protection and anodic protection	x	x	x		x	x								

10	water treatment for boilers and condensers	x	x	x		x	x								

6. Teaching and learning methods for disable students:

No.	Teaching Methods	Reason
1	Presentation of the course in digital material	Better access any time
2	Web communication with students	Better communication with certain cases
3	Asking small groups to do assignments; each composed of low ,medium and high performance students	Knowledge and skills transfer among different levels of students

7. Student evaluation:

7.1 Student evaluation method:

No.	Evaluation Method	Competencies	LO's
1	Periodic exams	A10/B2/A4	d1/d1/b1
2	Semester work(sheets,quizs,presentation)	A4/A10	c1/d1,d2
3	Final term examination	B2/B4	d1/d1

7.2 Evaluation Schedule:

No.	Evaluation Method	Weeks
1	Periodic exams	8th
2	Student load	2nd -7th - 9th-14th
3	Final term examination	15th

7.3 weighting of Evaluation:

No.	Evaluation Method	Marks
1	Periodic exams	20
2	Student load	20
3	Final term examination	60
Total		**100**

8. List of References:

No.	Reference List
1	Talbot, D. E., & Talbot, J. D. (2018). Corrosion science and technology. CRC press.
2	Cicek, V. (2017). Corrosion engineering and cathodic protection handbook: with extensive question and answer section. John Wiley & Sons

9. Facilities required for teaching and learning:

No.	Facility	No.	Facility
1	Lecture classroom	4	Data show system
2	Presenter	5	Sound system
3	White board		

10. Matrix of Competencies and LO's of the course:

No.	Topic	Aims	Competencies	LO's
1	Theories and principles of corrosion	8	A10	d1
2	Types of corrosion (Localized corrosion, pitting, crevice corrosion , cavitations, stress corrosion cracking and corrosion fatigue)	8	A10	d1
3	metallurgical factors	8	B2	d1
4	welding problems	8	B2	d1
5	material selection	7	A4/B2	b1/d1
6	Inspection and nondestructive testing	7	B2	d1
7	chemical cleaning flue gas attack	7	B2	d1
8	corrosion testing evaluation and simulation	7	A10	d2
9	corrosion prevention ,monitoring, cathode protection and anodic protection	7	A4/A10 /B4	c1/d2 /d1
10	water treatment for boilers and condensers	7	A10 /B4	d2 /d1

Course Coordinator: Asso.prof. Hend Elsayed Gadow
Head of Department: Asso.prof. Hend Elsayed Gadow
Date of Approval: 2023

Mechanical unit operation
CHE323

1-Basic Information:

Program Title	Chemical Engineering Program
Department Offering the Program	Chemical Engineering Department
Department Responsible for the Course	Chemical Engineering Department
Course Title	Mechanical Unit Operation
Course Code	CHE323
Year/Level	Level 3
Specialization	Major
Authorization Date of Course Specification	-

Teaching hours	**Lectures**	**Exercise**	**laboratory**	**Student's load**
	3	2	-	4

2-Course Aims:

No.	**Aims**
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.
7	Design a system, component, and process to meet recent technological advancements using computer systems in chemical engineering.

3- Competencies:

Competencies	**Learning Outcomes (LO'S)**
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 appropriate mechanical unit operations.	**a1**. Learn the general principles of design techniques specific to filtration, size reduction, centrifugation, sedimentation, solid drying and crystallization. **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.

A5. Practice research techniques and methods of investigation as an inherent part of learning.	**c1.** Prepare technical reports **d1.** Search for information to engage in lifelong self-learning discipline.
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.

4. Course Contents:

No.	Topics	Lecture	Exercise	laboratory	Student load
1	Filtration	3	2	-	4
2	Size reduction	3	2	-	4
3	Screening and Size Classification	3	2	-	4
4	Solid drying	6	4	-	8
5	Crystallization	3	2	-	4
6	Centrifugation	3	2	-	4
7	Sedimentation	6	4	-	8
8	Power consumption in gas /liquid contacting. Design principles for stirrer and model experiments for scale up.	3	2	-	4
9	Computation methods in multistage and multicomponent systems and operations including particulate solids	12	8		16
Total		**42**	**28**	**-**	**56**

5. Teaching and learning methods:

No	Topics	Face-to-Face Lecture	Online Lecture	Flipped Classroom	Presentation and movies	Discussion	Problem solving	Brain storming	Projects	Site visits	Self-learning and Research	Cooperative	Discovering	Modeling	lab
1	Filtration	x	x			x	x								
2	Size reduction	x	x			x					x				
3	Screening and Size Classification	x	x			x	x								
4	Solid drying	x	x			x	x				x				
5	Crystallization	x	x			x	x				x				
6	Centrifugation	x	x			x	x				x				
7	Sedimentation	x	x			x									
8	Power consumption in gas /liquid contacting. Design principles for stirrer and model experiments for scale up.	x	x			x									
9	Computation methods in multistage and multicomponent systems and operations including particulate solids	x	x			x					x				

6. Teaching and learning methods for disable students:

No.	Teaching Methods	Reason
1	Presentation of the course in digital material	Better access any time
2	Web communication with students	Better communication with certain cases
3	Asking small groups to do assignments; each composed of low ,medium and high performance students	Knowledge and skills transfer among different levels of students

7. Student evaluation:

7.1 Student Evaluation Method:

No.	Evaluation Method	Competencies	LO's
1	Periodic exams	A3/B1	a1/b1
2	Semester work (sheets, quizs)	A3/A5/B1	c1/d1,c1/c1
3	Final term examination	A3,B1	b1,a1

7.2 Evaluation Schedule:

No.	Evaluation Method	Weeks
1	Periodic exams	8th
2	Student load	2nd -7th - 9th-14th
3	Final term examination	15th

7.3 weighting of Evaluation:

No.	Evaluation method	Marks
1	Periodic exams	30
2	Student load	30
3	Final term examination	90
Total		**150**

8. List of References:

No.	Reference List
1	Course notes Lecture notes prepared by Ass. Prof. Dr. / Taha E. Farrag.
2	Recommended books Felder, R.M., and R.W. Rousseau, "Elementary Principles of Chemical Processes," 3rd ed., John Wiley, 2018.

9. Facilities required for teaching and learning:

No.	Facility	No.	Facility
1	Lecture classroom	4	Data show system

2	Presenter	5	Sound system
3	White board		

10. Matrix of Competencies and LO's of the course:

No.	Topic	Aims	Competencies	LO's
1	Filtration	1	A3	a1,c1
2	Size reduction	1	A5	c1
3	Screening and Size Classification	1	A5	d1
4	Solid drying	1	B1	a1,b1
5	Crystallization	1	A3	a1,b1
6	Centrifugation	1	A3	a1,c1
7	Sedimentation	1	A3	a1,b1
8	Power consumption in gas /liquid contacting. Design principles for stirrer and model experiments for scale up.	7	B1	c1
9	Computation methods in multistage and multicomponent systems and operations including particulate solids	7	B1	c1

Course Coordinator: Prof. Dr. / Taha E. Farrag

Head of Department: Asso.prof. Hend Elsayed Gadow

Date of Approval: 2023

Process Modeling and Simulation
CHE324

1-Basic Information:

Program Title	Chemical Engineering Program
Department Offering the Program	Chemical Engineering Department
Department Responsible for the Course	Chemical Engineering Department
Course Title	Process Modeling and Simulation
Course Code	CHE324
Year/Level	Level 3
Specialization	Major
Authorization Date of Course Specification	-

Teaching hours	Lectures	Exercise	laboratory	Student's load
	3	-	2	4

2-Course Aims:

No.	Aims
7	Design a system, component, and process to meet recent technological advancements using computer systems in chemical engineering.

3-Intended Learning Outcomes (LO'S):

Competencies	Learning Outcomes (LO'S)
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.	**a2.** Define the principles, basic properties, and features of Process Modeling and Simulation, as well as their use in chemical process industries such as petroleum refining, natural gas processing, petrochemicals, electrochemistry, fertilizers, and ceramics, etc. **b3**. Analyze and interpret data. **b4**. Evaluate components, systems, and processes are evaluated for their characteristics and performance.
B3. Apply numerical modeling methods and/or computational techniques appropriate to chemical engineering.	**d1.** Apply numerical modeling methods appropriate to topics in chemical engineering.

4. **Course Contents:**

No.	Topics	Lecture	Exercise	laboratory	Student load
1	Review of the basic principles of transport of momentum, heat, and mass with applied problems. **Practical** Natural gas processing Heat Exchanger	24	-	16	32
2	Numerical methods for solving more complex problems of transport phenomena and kinetics. **Practical** Chemical reaction	18	-	12	24
Total		**42**	**-**	**28**	**56**

5. **Teaching and learning methods:**

No	Topics	Face-to-Face Lecture	Online Lecture	Flipped Classroom	Presentation and movies	Discussion	Problem solving	Brain storming	Projects	Site visits	Self-learning and Research	Cooperative	Discovering	Modeling	lab

1	Review of the basic principles of transport of momentum, heat, and mass with applied problems. **Practical** • Natural gas processing • Heat Exchanger	x	x			x	x	x						x	x
2	Numerical methods for solving more complex problems of	x	x			x	x	x						x	x
	transport phenomena and kinetics. **Practical** Chemical reaction														

6. Teaching and learning methods for disable students:

No.	Teaching Methods	Reason
1	Presentation of the course in digital material	Better access any time
2	Web communication with students	Better communication with certain cases
3	Asking small groups to do assignments; each composed of low ,medium and high performance students	Knowledge and skills transfer among different levels of students

7. Student evaluation:

7.1 Student evaluation method:

No.	Evaluation Method	Competencies	LO's
1	Periodic exams	A2	a2,b4
2	Semester work (sheets, quizzes)	B3	d1
3	Practical Examination	B3	d1
4	Final term examination	A2	a2, b3,b4

7.2 Evaluation Schedule:

No.	Evaluation Method	Weeks
1	Periodic exams	8th
2	Student load	2nd -7th - 9th
3	Practical Examination	14th
4	Final term examination	15th

7.3 weighting of Evaluation:

No.	Evaluation method	Marks
1	Periodic exams	20
2	Student load	20
3	Practical Examination	10
4	Final term examination	50
Total		**100**

8. List of References:

No.	Reference List
1	Fundamentals of Acoustics, Modelling, Simulation, Algorithms and Acoustic Virtual Reality , Michael Vorländer, Springer International, 2020
2	Simulation Foundations, Methods and Applications Modelling and Simulation: Exploring Dynamic System Behaviour Louis G. Birta, Gilbert Arbez, Springer International Publishing, 2019

9. Facilities required for teaching and learning:

No.	Facility	No.	Facility
1	Lecture classroom	5	Data show system
2	Presenter	6	Sound system
3	White board		
4	Computer lab		

10. Matrix of Competencies and LO's of the course:

No.	Topic	Aims	Competencies	LO's

1	Review of the basic principles of transport of momentum, heat, and mass with applied problems.	7	A2	a2
	Practical • Natural gas processing • Heat Exchanger	7	A2	b4
2	Numerical methods for solving more complex problems of transport phenomena and kinetics.	7	B3	d1
	Practical Chemical reaction	7	A2	b3

Course Coordinator:. Dr. Sohir Abo baker
Head of Department: Asso.prof. Hend Elsayed Gadow
Date of Approval: 2023

Foams Industry
CHE325A

1-Basic Information:

Program Title	Chemical Engineering Program
Department Offering the Program	Chemical Engineering Department
Department Responsible for the Course	Chemical Engineering Department
Course Title	Foams Industry
Course Code	CHE325A
Year/Level	Level 4
Specialization	Major
Authorization Date of Course Specification	-

Teaching hours	Lectures	Exercise	laboratory	Student's load
	2	2	-	4

2-Course Aims:

No.	Aims
7	Design a system components and process to meet recent technological using computional system in food processing.
8	Consider the impact of foam industry on society, economics, and the environment using fundamental knowledge of chemical process industries

3- Competencies:

Competencies	Learning Outcomes (LO’S)
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 in foam industry. **b1** Summarize the appropriate techniques relevant to foam industry.

	c1 Create a process, component or system to carry out specialized foam industry 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 foam industry to respond to the challenging role and responsibilities of a professional chemical engineer

4. Course Contents:

No.	Topics	Lecture	Exercise	laboratory	Student load
1	Chemical composition and raw materials of foams	8	8	-	16
2	Low and high density foams	4	4	-	8
3	Testing of foams	8	8	-	16
4	Additives improving properties of foams	8	8	-	16
Total		**28**	**28**	-	**56**

5. Teaching and learning methods:

No	Topics	Face-to-Face Lecture	Online Lecture	Flipped Classroom	Presentation and movies	Discussion	Problem solving	Brain storming	Projects	Site visits	Self-learning and Research	Cooperative	Discovering	Modeling	lab

1	Chemical composition and raw materials of foams	**x**	**x**	**x**	**x**	**x**					**x**				
2	Low and high density foams	**x**	**x**	**x**	**x**	**x**					**x**				
3	Testing of foams	**x**	**x**	**x**	**x**	**x**					**x**				
4	Additives improving properties of foams	**x**	**x**	**x**	**x**	**x**					**x**				

6. Teaching and learning methods for disable students:

No.	Teaching Methods	Reason
1	Presentation of the course in digital material	Better access any time
2	Web communication with students	Better communication with certain cases
3	Asking small groups to do assignments; each composed of low ,medium and high performance students	Knowledge and skills transfer among different levels of students

7. Student evaluation:

7.1 Student evaluation method:

No.	Evaluation Method	Competencies	LO’s
1	Periodic exams	B1	a1,b1,c1
2	Semester work(sheets, quizzes, presentation)	B1,B2	c1,d1
3	Final term examination	B1/B2	a1,b1/d1

7.2 Evaluation Schedule:

No.	Evaluation Method	Weeks
1	Periodic exams	8th
2	Student load	2nd -7th - 9th-14th
3	Final term examination	15th

7.3 weighting of Evaluation:

No.	Evaluation method	Marks
1	Periodic exams	20
2	Student load	20
3	Final term examination	60
Total		**100**

8. List of References:

No.	Reference List

1	Defonseka, C. (2019). Flexible Polyurethane Foams. De Gruyter.

9. Facilities required for teaching and learning:

No.	Facility	No.	Facility
1	Lecture classroom	4	Data show system
2	Presenter	5	Sound system
3	White board		

10. Matrix of Competencies and LO's of the course::

No.	Topic	Aims	Competencies	LO's
1	Chemical composition and raw materials of foams	7,8	B1	a1
2	Low and high density foams	7,8	B1	b1,c1
3	Testing of foams	7,8	B2	d1
4	Additives improving properties of foams	7,8	B2	d1

Course Coordinator: Asso.prof. Hend Elsayed Gadow
Head of Department: Asso.prof. Hend Elsayed Gadow
Date of Approval: 2023

Ceramics Industry
CHE325B

1-Basic Information:

Program Title	Chemical Engineering Program
Department Offering the Program	Chemical Engineering Department
Department Responsible for the Course	Chemical Engineering Department
Course Title	Ceramics Industry
Course Code	CHE325B
Year/Level	Level 3
Specialization	Major
Authorization Date of Course Specification	-

Teaching hours	Lectures	Exercise	laboratory	Student's load
	2	2	-	4

2-Course Aims:

No.	Aims
7	Design a system components and process to meet recent technological using computional system in ceramic industry.
8	Consider the impact of ceramic industry on society, economics, and the environment using fundamental knowledge of chemical process industries

3- Competencies:-

Competencies	Learning Outcomes (LO'S)

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 in ceramic industry industry. **b1** Summarize the appropriate techniques relevant to ceramic industry. **c1** Create a process, component or system to carry out specialized ceramic industry 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 ceramic industry to respond to the challenging role and responsibilities of a professional chemical engineer

4. Course Contents:

No.	Topics	Lecture	Exercise	laboratory	Student load
1	General ceramics fabrication processes	4	4	-	8
2	preparation of raw material	6	6	-	12
3	Cold forming processes	8	8	-	16
4	ceramic building material; bricks, tiles, sewer pipes	6	6	-	12
5	Sanitary ware.	4	4	-	8
Total		**28**	**28**	**-**	**56**

5. Teaching and learning methods:

No	Topics	Face-to-Face Lecture	Online Lecture	Flipped Classroom	Presentation and movies	Discussion	Problem solving	Brain storming	Projects	Site visits	Self-learning and Research	Cooperative	Discovering	Modeling	lab
1	General ceramics fabrication processes	x	x			x									
2	preparation of raw material	x	x			x									
3	Cold forming processes	x	x	x		x					x				
4	ceramic building material; bricks, tiles, sewer pipes	x	x			x					x				
5	Sanitary ware.	x	x		x	x					x				

6. Teaching and learning methods for disable students:

No.	Teaching Methods	Reason
1	Presentation of the course in digital material	Better access any time
2	Web communication with students	Better communication with certain cases

3	Asking small groups to do assignments; each composed of low ,medium and high performance students	Knowledge and skills transfer among different levels of students

7. Student evaluation:

7.1 Student evaluation method:

No.	Evaluation Method	Competencies	LO's
1	Periodic exams	B1	a1,b1,c1
2	Semester work(sheets, quizzes, presentation)	B1,B2	c1,d1
3	Final term examination	B1/B2	a1,b1/d1

7.2 Evaluation Schedule:

No.	Evaluation Method	Weeks
1	Periodic exams	8th
2	Student load	2nd -7th - 9th-14th
3	Final term examination	15th

7.3 weighting of Evaluation:

No.	Evaluation method	Marks
1	Periodic exams	20
2	Student load	20
3	Final term examination	60
Total		**100**

8. List of References:

No.	Reference List
1	Materials Chemistry of Ceramic,Junichi Hojo, Springer Singapore, 2019

9. Facilities required for teaching and learning:

No.	Facility	No.	Facility
1	Lecture classroom	4	Data show system
2	Presenter	5	Sound system

3	White board

10. Matrix of Competencies and LO's of the course::

No.	Topic	Aims	Competencies	LO's
1	General ceramics fabrication processes	8	B2	d1
2	preparation of raw material	8	B2	d1
3	Cold forming processes	7	B1	a1 c1,b1
4	ceramic building material; bricks, tiles, sewer pipes	8	B2	d1
5	Sanitary ware.	7	B1	b1,c1

Course Coordinator: Asso.prof. Hend Elsayed Gadow

Head of Department: Asso.prof. Hend Elsayed Gadow

Date of Approval: 2023

Polymer Engineering
CHE325C

1-Basic Information:

Program Title	Chemical Engineering Program
Department Offering the Program	Chemical Engineering Department
Department Responsible for the Course	Chemical Engineering Department
Course Title	Polymer Engineering
Course Code	CHE325C
Year/Level	Level 3
Specialization	Major
Authorization Date of Course Specification	-

Teaching hours	**Lectures**	**Exercise**	**laboratory**	**Student's load**
	2	2	-	4

2-Course Aims:

No.	**Aims**
7	Design a system components and process to meet recent technological using computional system in polymer engineering.
8	Consider the impact of polymer engineering on society, economics, and the environment using fundamental knowledge of chemical process industries

3- Competencies:

Competencies	**Learning Outcomes (LO'S)**

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 in polymer engineering. **b1** Summarize the appropriate techniques relevant to polymer engineering. **c1** Create a process, component or system to carry out specialized polymer engineering design.
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 polymer engineering to respond to the challenging role and responsibilities of a professional chemical engineer

4. Course Contents:

No.	Topics	Lecture	Exercise	laboratory	Student load
1	Polymer chemistry and types of polymerization reactions.	4	4	-	8
2	Polymerization techniques	2	2	-	4
3	measurement of molecular weight	2	2	-	4
4	Classification of polymers	2	2	-	4
5	plastics, elastomers	4	4	-	8
6	thermoplastics and thermosetting resins	2	2	-	4
7	Structure, mechanical and physical properties of polymers	2	2	-	4
8	manufacture of polymers	2	2	-	4
9	Polymer processing	2	2	-	4
10	Extrusion	2	2	-	4
11	Injection and blow molding	2	2	-	4
12	Manufacture and properties of some commercial polymers	2	2	-	4
Total		**28**	**28**	**-**	**56**

5. Teaching and learning methods:

No	Topics	Face-to-Face Lecture	Online Lecture	Flipped Classroom	Presentation and movies	Discussion	Problem solving	Brain storming	Projects	Site visits	Self-learning and Research	Cooperative	Discovering	Modeling	lab
1	Polymer chemistry and types of polymerization reactions.	x	x			x					x				
2	Polymerization techniques	x	x	x		x									
3	measurement of molecular weight	x	x			x	x								
4	Classification of polymers	x	x			x					x				
5	plastics, elastomers	x	x			x									
6	thermoplastics and thermosetting resins	x	x			x					x				
7	Structure, mechanical and physical properties of polymers	x	x			x					x				
8	manufacture of polymers	x	x			x					x				
9	Polymer processing	x	x	x		x									
10	Extrusion	x	x								x				

11	Injection and blow molding	x	x			x									
12	Manufacture and properties of some commercial polymers	x	x	x		x									

6. Teaching and learning methods for disable students:

No.	Teaching Methods	Reason
1	Presentation of the course in digital material	Better access any time
2	Web communication with students	Better communication with certain cases
3	Asking small groups to do assignments; each composed of low ,medium and high performance students	Knowledge and skills transfer among different levels of students

7. Student evaluation:

7.1 Student evaluation method:

No.	Evaluation Method	Competencies	LO's
1	Periodic exams	B1	a1,b1,c1
2	Semester work (sheets, quizs, presentation)	B1,B2	c1,d1
3	Final term examination	B1/B2	a1,b1/d1

7.2 Evaluation Schedule:

No.	Evaluation Method	Weeks
1	Periodic exams	8th
2	Student load	2nd -7th - 9th -14th
3	Final term examination	15th

7.3 weighting of Evaluation:

No.	Evaluation method	Marks
1	Periodic exams	20
2	Student load	20
3	Final term examination	60
Total		**100**

8. List of References:

No.	Reference List
1	Anil Kumar, Rakesh K. Gupta " Fundamentals of Polymer Engineering" 3rd CRC Press, (2019).

2	Stoyko Fakirov" Fundamentals of Polymer Science for Engineers" Wiley-VCH Verlag GmbH & Co. KGaA (2017).

9. Facilities required for teaching and learning:

No.	Facility	No.	Facility
1	Lecture classroom	4	Data show system
2	Presenter	5	Sound system
3	White board		

10. Matrix of Competencies and LO's of the course:

No.	Topic	Aims	Competencies	LO's
1	Polymer chemistry and types of polymerization reactions.	7	B1	a1,b1
2	Polymerization techniques	8	B1	c1
3	Measurement of molecular weight	8	B2	d1
4	Classification of polymers	7	B1	b1,c1
5	Plastics, elastomers	7	B2	d1
6	Thermoplastics and thermosetting resins	8	B1	b1,c1
7	Structure, mechanical and physical properties of polymers	8	B1	a1
8	manufacture of polymers	7	B1	b1,c1
9	Polymer processing	8	B2	d1
10	Extrusion	7	B1	a1,b1
11	Injection and blow molding	8	B1	c1
12	Manufacture and properties of some commercial polymers	8	B2	d1

Course Coordinator: Dr. / Mohamed fakieh
Head of Department: Asso.prof. Hend Elsayed Gadow
Date of Approval: 2023

Food processing technology

CHE325D

1-Basic Information:

Program Title	Chemical Engineering Program
Department Offering the Program	Chemical Engineering Department
Department Responsible for the Course	Chemical Engineering Department
Course Title	Food Processing Technology
Course Code	CHE325D
Year/Level	Level 3
Specialization	Major
Authorization Date of Course Specification	-

Teaching hours	Lectures	Exercise	laboratory	Student's load
	2	2	-	4

2-Course Aims:

No.	Aims
7	Design a system components and process to meet recent technological using computational system in food processing.
8	Consider the impact of foam industry on society, economics, and the environment using fundamental knowledge of chemical process industries

3- Competencies:

Competencies	Learning Outcomes (LO'S)
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 in Food processing technology. **b1**. Summarize the appropriate techniques relevant to Food processing technology **c1** Create a process, component or system to carry out specialized Food processing technology 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 food processing technology to respond to the challenging role and responsibilities of a professional chemical engineer

4. Course Contents:

No.	Topics	Lecture	Exercise	laboratory	Student load
1	The requirement for food production.	4	4	-	8
2	The standardization and toxicology in food production.	4	4	-	8
3	Batch and continuous food production technology.	4	4	-	8
4	The selected materials in food production and packing.	4	4	-	8
5	The quality control in food technology	4	4	-	8
6	The requirement for obtained good quality and updated the processing according to constrains.	4	4	-	8
7	Future of food production technology	4	4	-	8
Total		**28**	**28**	-	**56**

5. Teaching and learning methods:

No	Topics	Face-to-Face Lecture	Online Lecture	Flipped Classroom	Presentation and movies	Discussion	Problem solving	Brain storming	Projects	Site visits	Self-learning and Research	Cooperative	Discovering	Modeling	lab

1	The requirement for food production.	x	x		x	x					x				
2	The standardization and toxicology in food production.	x	x		x	x					x				
3	Batch and continuous food production technology.	x	x		x	x					x				
4	The selected materials in food production and packing.	x	x	x	x	x					x				
5	The quality control in food technology	x	x		x	x					x				
6	The requirement for obtained good quality and updated the processing according to constrains.	x	x	x	x	x					x				
7	Future of food production technology	x	x		x	x					x				

6. Teaching and learning methods for disable students:

No.	Teaching Methods	Reason
1	Presentation of the course in digital material	Better access any time
2	Web communication with students	Better communication with certain cases
3	Asking small groups to do assignments; each composed of low ,medium and high performance students	Knowledge and skills transfer among different levels of students

7. Student evaluation:

7.1 Student evaluation method:

No.	Evaluation Method	Competencies	LO's
1	Periodic exams	B1	a1,b1,c1
2	Semester work(sheets, quizzes, presentation)	B1,B2	c1,d1
3	Final term examination	B1/B2	a1,b1/d1

7.2 Evaluation Schedule:

No.	Evaluation Method	Weeks
1	Periodic exams	8th

2	Student load	2nd -7th - 9th -14th
3	Final term examination	15th

7.3 weighting of Evaluation:

No.	Evaluation method	Marks
1	Periodic exams	20
2	Student load	20
3	Final term examination	60
Total		**100**

8. List of References:

No.	Reference List
1	Anal, A. K. (Ed.). (2017). Food processing by-products and their utilization. John Wiley & Sons.
2	Bekhit, A. E. D. A. (Ed.). (2017). Advances in Meat Processing Technology. CRC Press

9. Facilities required for teaching and learning:

No.	Facility	No.	Facility
1	Lecture classroom	4	Data show system
2	Presenter	5	Sound system
3	White board		

10. Matrix of Competencies and LO's of the course:

No.	Topic	Aims	Competencies	LO's
1	The requirement for food production.	8	B1	a1
2	The standardization and toxicology in food production.	8	B1	a1
3	Batch and continuous food production technology.	7	B1	b1
4	The selected materials in food production and packing.	8	B2	d1

5	The quality control in food technology	7	B1	c1
6	The requirement for obtained good quality and updated the processing according to constrains.	7	B1	c1
7	Future of food production technology	8	B2	d1

Course Coordinator: Asso.prof. Hend Elsayed Gadow

Head of Department: Asso.prof. Hend Elsayed Gadow

Date of Approval: 2023

Training (2)
CHE326

1- Basic Information:

Program Title	Chemical Engineering program
Department Offering the Program	Chemical Engineering department
Department Responsible for the Course	Chemical Engineering department
Course Title	Training 2
Course Code	CHE326
Year/Level	Level:3
Specialization	Major
Authorization Date of Course Specification	-

Teaching hours	Lectures	Exercise	laboratory	Student's load
	-	-	-	-

2- Course Aims:

No.	Aims
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.

3- Intended Learning Outcomes (ILO’S):

Competencies	Learning Outcomes (LO’S)
A5. Practice research techniques and methods of investigation as an inherent part of learning.	**c1.** Prepare technical reports **d1.** Search for information to engage in lifelong self-learning discipline.

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**. Professionally merge the engineering knowledge, understanding, and feedback to improve design, products and/or services.
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**.Participate in recent technological advancements and developing disciplines important to chemical engineering in order to respond to the demanding role and obligations of a professional chemical engineer.

4. Course Contents:

No.	Topics	Lecture	Exercise	laboratory	Student load
1	Students in the field training o[f chemical engineering they will be expected to apply design to solve a given real world problem.	-	-	-	-
2	Presentations will be emphasized in addition to the technical content.	-	-	-	-
Total		-	-	-	-

5. Teaching and learning methods:

No	Topics	Face-to-Face Lecture	Online Lecture	Flipped Classroom	Presentation and movies	Discussion	Problem solving	Brain storming	Projects	Site visits	Self-learning and Research	Cooperative	Discovering	Modeling	lab

1	Students in the field training o[f chemical engineering they will be expected to apply design to solve a given real world problem.	x			x				x	x	x	x			
2	Presentations will be emphasized in addition to the technical content.	x			x				x	x	x	x			

6. Teaching and learning methods for disable students:

No.	Teaching Methods	Reason
1	Presentation of the course in digital material	Better access any time
2	Web communication with students	Better communication with certain cases
3	Asking small groups to do assignments; each composed of low ,medium and high performance students	Knowledge and skills transfer among different levels of students

7. Student evaluation:

7.1 Student Evaluation Method:

No.	Evaluation Method	Competencies	LO's
1	Oral Examination	A5/A10	c1,d1/d1,d2
2	Final report (presentation, Report)	A5,B2	c1,d1

7.2 Evaluation Schedule:

No.	Evaluation Method	Weeks
1	Oral Examination	at the end of training
2	Final report (presentation, Report)	4th

7.3 weighting of Evaluation:

No.	Evaluation method	Marks
1	Oral Examination	30
2	Final work (presentation, Report)	20
Total		**50**

8. List of References:

No.	Reference List
1	Subject studies

9. Facilities required for teaching and learning:

No.	Facility	No.	Facility
1	Lecture classroom	5	Data show system
2	Presenter	6	Sound system
3	White board		
4	Industrial field		

10. Matrix of Competencies and LO's of the course::

No.	Topic	Aims	Competencies	LO's
1	Students in the field training of chemical engineering they will be expected to apply design to solve a given real world problem.	8,9,10	A5/A10	c1,d1/d1,d2
2	Presentations will be emphasized in addition to the technical content.	8,9,10	A5,B2	c1,d1

Course Coordinator: Asso.prof. Hend Elsayed Gadow

Head of Department: Asso.prof. Hend Elsayed Gadow

Date of Approval: 2023

Computer applications in Chemical Engineering

1-Basic Information:

Program Title	Chemical Engineering Program
Department Offering the Program	Chemical Engineering Department
Department Responsible for the Course	Chemical Engineering Department
Course Title	Computer applications in Chemical Engineering
Course Code	CHE411
Year/Level	Level4
Specialization	Major
Authorization Date of Course Specification	-

Teaching hours	Lectures	Exercise	laboratory	Student's load
	2	-	2	4

2-Course Aims:

No.	Aims
7	Design a system, component, and process to meet recent technological advancements using computer systems in chemical engineering.
9	Demonstrate current technical expertise by addressing process dynamic and control challenges in plant operations.

3- Competencies:

Competencies	Learning Outcomes (LO'S)
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.

B3. Apply numerical modeling methods and/or computational techniques appropriate to chemical engineering.	d1 Apply computational techniques appropriate to chemical engineering.

4. Course Contents:

No.	Topics	Lecture	Exercise	laboratory	Student load
1	Introduction **Practical** Application of MATLAB for some problem of chemical Engineering	6	-	4	8
2	Equations of state **Practical** Application of MATLAB for some problem of chemical Engineering	6	-	4	8
3	Vapor- liquid Equilibrium **Practical** Application of MATLAB for some problem of chemical Engineering	6	-	4	8
4	Chemical reaction Equilibrium **Practical** Application of MATLAB for some problem of chemical Engineering	6	-	4	8
5	Mass Balances with recycle stream **Practical** Application of MATLAB for some problem of chemical Engineering	6	-	4	8
6	Chemical reactors **Practical** Application of MATLAB for some problem of chemical Engineering	6	-	4	8
7	MATLAB overview **Practical** Application of MATLAB for some problem of chemical Engineering	6	-	4	8
Total		**42**	**-**	**28**	**56**

5. Teaching and learning methods:

No	Topics	Face-to-Face Lecture	Online Lecture	Flipped Classroom	Presentation and movies	Discussion	Problem solving	Brain storming	Projects	Site visits	Self-learning and Research	Cooperative	Discovering	Modeling	lab
1	Introduction **Practical** Application of MATLAB for some problem of chemical Engineering	x	x			x									x
2	Equations of state **Practical** Application of MATLAB for some problem of chemical Engineering	x	x				x								x
3	Vapor- liquid Equilibrium **Practical** Application of MATLAB for some problem of chemical Engineering	x	x				x								x
4	Chemical reaction Equilibrium **Practical** Application of MATLAB for some problem of chemical Engineering	x	x				x	x							x

5	Mass Balances with recycle stream **Practical** Application of	**x**	**x**			**x**		**x**							**x**
	MATLAB for some problem of chemical Engineering														
6	Chemical reactors **Practical** Application of MATLAB for some problem of chemical Engineering	**x**	**x**			**x**	**x**	**x**							**x**
7	MATLAB overview **Practical** Application of MATLAB for some problem of chemical Engineering	**x**	**x**			**x**	**x**								**x**

6. Teaching and learning methods for disable students:

No.	Teaching Methods	Reason
1	Presentation of the course in digital material	Better access any time
2	Web communication with students	Better communication with certain cases
3	Asking small groups to do assignments; each composed of low ,medium and high performance students	Knowledge and skills transfer among different levels of students

7. Student evaluation:

7.1 Student Evaluation Method:

No.	Evaluation Method	Competencies	LO’s
1	Periodic exams	B1	a1
2	Semester work (sheets, quizs)	B1,B3	c1,d1
3	Practical Examination	B1,B3	c1,d1
4	Final term examination	B1/B3	a1,b1/d1

7.2 Evaluation Schedule:

No.	Evaluation Method	Weeks
1	Periodic exams	8th
2	Student load	2nd -7th - 9th
3	Practical Examination	14th
4	Final term examination	15th

7.3 weighting of Evaluation:

No.	Evaluation method	Marks
1	Periodic exams	20
2	Student load	20
3	Practical Examination	10
4	Final term examination	50
Total		**100**

8. List of References:

No.	Reference List
1	Hussein K. Abdel-Aal, Chemical Engineering Primer with Computer Applications , 2017,CRC Press.

9. Facilities required for teaching and learning:

No.	Facility	No.	Facility
1	Lecture classroom	5	Data show system
2	Presenter	6	Sound system
3	White board		
4	Computer lab		

10. Matrix of Competencies and LO's of the course:

No.	Topic	Aims	Competencies	LO's
1	Introduction	7,9	B1	a1

	Practical Application of MATLAB for some problem of chemical Engineering			
2	Equations of state **Practical** Application of MATLAB for some problem of chemical Engineering	7,9	B1	a1
3	Vapor- liquid Equilibrium **Practical** Application of MATLAB for some problem of chemical Engineering	7,9	B1	a1
4	Chemical reaction Equilibrium	7,9	B1	a1
	Practical Application of MATLAB for some problem of chemical Engineering			
5	Mass Balances with recycle stream **Practical** Application of MATLAB for some problem of chemical Engineering	7,9	B1	c1
6	Chemical reactors **Practical** Application of MATLAB for some problem of chemical Engineering	7,9	B1	b1,c1
7	MATLAB overview **Practical** Application of MATLAB for some problem of chemical Engineering	7,9	B3	d1

Course Coordinator: Prof. Dr. / Taha E. Farrag
Head of Department: Asso.prof. Hend Elsayed Gadow
Date of Approval: 2023

Petrochemical Engineering

CHE412

1-Basic Information:

Program Title	Chemical Engineering Program
Department Offering the Program	Chemical Engineering Department
Department Responsible for the Course	Chemical Engineering Department
Course Title	Petrochemical Engineering
Course Code	CHE412
Year/Level	Level 4
Specialization	Major
Authorization Date of Course Specification	-

Teaching hours	**Lectures**	**Exercise**	**laboratory**	**Student's load**
	2	2	-	4

2-Course Aims:

No.	**Aims**
7	Design a system components and process to meet recent technological using computional system in Petrochemical engineering.

3- Competencies:

Competencies	**Learning Outcomes (LO'S)**
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 Petrochemical 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 Petrochemical engineering. **c1** Create a process, component or system to carry out specialized Petrochemical 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 petrochemicals engineering to respond to the challenging role and responsibilities of a professional chemical engineer

4. Course Contents:

No.	Topics	Lecture	Exercise	laboratory	Student load
1	Petroleum chemistry; occurrence and composition of crude oil	2	2	-	4
2	Distillation	2	2	-	4
3	catalytic and thermal cracking	6	6	-	12
4	Alkylation	2	2	-	4
5	Hydrogenation	2	2	-	4
6	Isomerization	2	2	-	4
7	Polymerization	2	2	-	4
8	Techniques and economics of the production of basic and intermediate petrochemicals as well as some end products	10	10	-	20
Total		**28**	**28**	-	**56**

5. Teaching and learning methods:

No	Topics	Face-to-Face Lecture	Online Lecture	Flipped Classroom	Presentation and movies	Discussion	Problem solving	Brain storming	Projects	Site visits	Self-learning and Research	Cooperative	Discovering	Modeling	lab

1	Petroleum chemistry; occurrence and composition of crude oil	x	x	x	x	x									
2	Distillation	x	x			x	x								
3	catalytic and thermal cracking	x	x		X	x									
4	alkylation	x	x	x		x					x				
5	hydrogenation	x	x	x		x					x				
6	isomerization	x	x	x		x					x				
7	polymerization	x	x	x		x					x				
8	Techniques and economics of the production of basic and intermediate petrochemicals as well as some end products	x	x		x						x				

6. Teaching and learning methods for disable students:

No.	Teaching Methods	Reason
1	Presentation of the course in digital material	Better access any time
2	Web communication with students	Better communication with certain cases
3	Asking small groups to do assignments; each composed of low ,medium and high performance students	Knowledge and skills transfer among different levels of students

7. Student evaluation:

7.1 Student Evaluation Method:

No.	Evaluation Method	Competencies	LO's
1	Periodic exams	B1	a1,b1
2	Semester work (sheets, quizs)	B1,B2	c1,d1
3	Final term examination	B1/B2	b1,c1/d1

7.2 Evaluation Schedule:

No.	Evaluation Method	Weeks
1	Periodic exams	8_{th}
2	Student load	2_{nd} -7_{th} - 9_{th} -14_{th}
3	Final term examination	15^{th}

7.3 weighting of Evaluation:

No.	Evaluation method	Marks
1	Periodic exams	30
2	Student load	30
3	practical /oral	15
4	Final term examination	75
Total		**150**

8. List of References:

No.	Reference List
1	B. K. Bhaskararao "Petrochemicals: An Introduction" Mercury Learning and Information (2018).
2	Uttam Ray Chaudhuri "Fundamentals of Petroleum and Petrochemical Engineering" CRC Press; 1st edition, (2020).

9. Facilities required for teaching and learning:

No.	Facility	No.	Facility
1	Lecture classroom	4	Data show system
2	Presenter	5	Sound system
3	White board		

10. Matrix of Competencies and LO's of the course:

No.	Topic	Aims	Competencies	LO's
1	Petroleum chemistry; occurrence and composition of crude oil	7	B1	a1
2	Distillation	7	B1	a1
3	Catalytic and thermal cracking	7	B1	b1,c1
4	Alkylation	7	B1	b1,c1
5	Hydrogenation	7	B1	b1,c1
6	Isomerization	7	B1	b1,c1
7	Polymerization	7	B1	b1,c1

8	Techniques and economics of the production of basic and intermediate petrochemicals as well as some end products	7	B2	d1

Course Coordinator: Dr. / Mohamed fakih

Head of Department: Asso.prof. Hend Elsayed Gadow

Date of Approval: 2023

Plant Design

CHE413

1-Basic Information:

Program Title	Chemical Engineering Program
Department Offering the Program	Chemical Engineering Department
Department Responsible for the Course	Chemical Engineering Department
Course Title	Plant Design
Course Code	CHE413
Year/Level	Level 4
Specialization	Major
Authorization Date of Course Specification	-

Teaching hours	Lectures	Exercise	laboratory	Student's load
	3	2	-	4

2-Course Aims:

No.	Aims
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.

3- Competencies:

Competencies	Learning Outcomes (LO'S)
A9. flexible thinking and acquire entrepreneurial and leadership skills to anticipate and respond to new situations.	**d1** Think creatively in solving problems of design. **d2** Effectively manage tasks, time, and resources. **d3** Refer to relevant literatures.

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.
B3. Apply numerical modeling methods and/or computational techniques appropriate to chemical engineering.	**d1** Apply numerical modeling methods and/or computational techniques appropriate to plant design
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 plant.

4. Course Contents:

No.	Topics	Lecture	Exercise	laboratory	Student load
1	The anatomy of a chemical manufacturing process- The Organization of A Chemical Engineering Project- Practical Considerati in Design	6	4	-	8
2	The Design Approach- Types of Designs- Scale-up in Design- Safety Factors- Specification Sheets-	4	2	-	6
3	Construction of a detailed flowsheet using a process simulator (currently HYSIS) -	4	2	-	6
4	- Material and energy balances - Conservation of material and energy flows.	4	2	-	4
5	Detailed design of equipment: size, construction details, materials of	6	4	-	8

	construction, instrumentation and control.				
6	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-	6	6	-	8
7	-process economics- optimum design and design strategy-	6	4	-	8
8	materials transfer, handling and treatment.	6	4	-	8
Total		**42**	**28**	**-**	**56**

5. Teaching and learning methods:

No	**Topics**	**Face-to-Face Lecture**	**Online Lecture**	**Flipped Classroom**	**Presentation and movies**	**Discussion**	**Problem solving**	**Brain storming**	**Projects**	**Site visits**	**Self-learning and Research**	**Cooperative**	**Discovering**	**Modeling**	**lab**
1	The anatomy of a chemical manufacturing process- The Organization of A Chemical Engineering Project- Practical Considerations in Design	**x**	**x**			**x**									

2	The Design Approach- Types of Designs- Scale-up in Design- Safety Factors- Specification Sheets-	x	x			**x**									
3	Construction of a detailed flowsheet using a process simulator (currently HYSIS) -	x	x				**x**								
4	- Material and energy balances - Conservation of material and energy flows.	x	x				**x**	**x**	**x**						
5	Detailed design of equipment: size, construction details, materials of construction, instrumentation and control.	x	x			**x**	**x**	**x**	**x**						
6	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-	x	x			**x**	**x**	**x**	**x**						
7	-process economics- optimum design and design strategy-	x	x			**x**	**x**								
8	Materials transfer, handling and treatment.	**x**	**x**		**x**										

6. Teaching and learning methods for disable students:

No.	Teaching Methods	Reason
1	Presentation of the course in digital material	Better access any time
2	Web communication with students	Better communication with certain cases
3	Asking small groups to do assignments; each composed of low ,medium and high performance students	Knowledge and skills transfer among different levels of students

7. Student evaluation:

7.1 Student evaluation method:

No.	Evaluation Method	Competencies	LO's
1	Periodic exams	B1	a1,b1
2	Semester work (sheets, quizs ,reports)	A9,B1,B3	d3,d2, a1,b1,d1
3	Final term examination	A9,B1	a1,b1,d1,d2

7.2 Evaluation Schedule:

No.	Evaluation Method	Weeks
1	Periodic exams	8_{th}
2	Student load	2_{nd} -7_{th} - 9_{th} -14_{th}
3	Final term examination	15^{th}

7.3 weighting of Evaluation:

No.	Evaluation method	Marks
1	Periodic exams	30
2	Student load	30
3	Final term examination	90
Total		**150**

8. List of References:

No.	Reference List
1	Don Green,Marylee Z. Southard, "Perry's Chemical Engineers' Handbook", 9th Edition, McGraw-Hill Education, 2018.

9. Facilities required for teaching and learning:

No.	Facility	No.	Facility
1	Lecture classroom	4	Data show system
2	Presenter	5	Sound system
3	White board		

10. Matrix of Competencies and LO's of the course:

No.	Topic	Aims	Competencies	LO's
1	The anatomy of a chemical manufacturing process- The Organization of A Chemical Engineering Project- Practical Considerations in Design	8	A9	d3
2	The Design Approach- Types of Designs- Scale-up in Design- Safety Factors- Specification Sheets-	9	A9	d3
3	Construction of a detailed flowsheet using a process simulator (currently HYSIS) -	7	B1,B4	c1,d1
4	- Material and energy balances - Conservation of material and energy flows.	7	B1	a1
5	Detailed design of equipment: size, construction details, materials of construction, instrumentation and control.	7	B1	b1
6	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-	7	B4	d1
7	-process economics- optimum design and design strategy-	9	A9	d2
8	materials transfer, handling and treatment.	9	A9	d1

Course Coordinator: Dr. / Riham Atef

Head of Department: Asso.prof. Hend Elsayed Gadow

Date of Approval: 2023

Project 1
CHE414

1-Basic Information:

Program Title	Chemical Engineering Program
Department Offering the Program	Chemical Engineering Department
Department Responsible for the Course	Chemical Engineering Department
Course Title	Project 1
Course Code	CHE414
Year/Level	Level 4
Specialization	Major
Authorization Date of Course Specification	-

Teaching hours	Lectures	Exercise	laboratory	Student's load
	3	-	2	4

2-Course Aims:

No.	Aims
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.
6	Analyze data from the intended tests to manage resources creatively.

3-Competencies:

Competencies	Learning Outcomes (LO'S)
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.	**c1** Choose relevant mathematical and computer-based methodologies for problem modelling and analysis. **c2** Develop suitable experimentation and/or simulation .

	c3 Applying 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.	**c1** Incorporate economic, societal, global, environmental, and risk management factors into design. **c2** Applying engineering design procedures to generate cost-effective solutions while adhering to the principles and contexts of sustainable design and development
A5. Practice research techniques and methods of investigation as an inherent part of learning.	**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.	**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

4. Course Contents:

No.	Topics	Lecture	Exercise	laboratory	Student load
1	Application of principles of chemical engineering to chemical industries proje	28	-	18	36
2	Reports and presentations	14	-	10	20
Total		**42**	**-**	**28**	**56**

5. Teaching and learning methods:

No	Topics	Face-to-Face Lecture	Online Lecture	Flipped Classroom	Presentation and movies	Discussion	Problem solving	Brain storming	Projects	Site visits	Self-learning and Research	Cooperative	Discovering	Modeling	lab
1	Application of principles of chemical engineering to chemical industries projects	x		x	x				x	x	x	x	x		x
2	Reports and presentations				x				x	x	x	x			

6. Teaching and learning methods for disable students:

No.	Teaching Methods	Reason
1	Presentation of the course in digital material	Better access any time
2	Web communication with students	Better communication with certain cases
3	Asking small groups to do assignments; each composed of low ,medium and high performance students	Knowledge and skills transfer among different levels of students

7. Student evaluation:

7.1 Student Evaluation Method:

No.	Evaluation Method	Competencies	LO’s
1	Oral Examination	A5,A6	b1,c1,c2,d1
2	Semester work (presentation, Report)	A2,A3	c1,c2,c3

7.2 Evaluation Schedule:

No.	Evaluation Method	Weeks
1	Oral Examination	at the end of IE 510
2	Student load	2nd -7th - 9th -14th

7.3 weighting of Evaluation:

No.	Evaluation Method	Marks
1	Oral Examination	75
2	Student load	75
Total		**150**

8. List of References:

No.	Reference List
1	Subject studies

9. Facilities required for teaching and learning:

No.	Facility	No.	Facility
1	Lecture classroom	5	Data show system
2	Presenter	6	Sound system
3	White board		
4	Lab		

10. Matrix of Competencies and LO's of the course:

No.	Topic	Aims	Competencies	LO's
1	Application of principles of chemical engineering to chemical industries projects	1,2,6	A2,A3	c1,c2,c3
2	Reports and presentations	1,2,6	A5,A6	c1,d1,b1,c2

Course Coordinator: Asso.prof. Hend Elsayed Gadow

Head of Department: Asso.prof. Hend Elsayed Gadow

Date of Approval: 2023

Electroplating

CHE415A

1-Basic Information:

Program Title	Chemical Engineering program
Department Offering the Program	Chemical Engineering Department
Department Responsible for the Course	Chemical Engineering Department
Course Title	Electroplating
Course Code	CHE415A
Year/Level	Level4
Specialization	Major
Authorization Date of Course Specification	-

Teaching hours	**Lectures**	**Exercise**	**laboratory**	**Student's load**
	2	2	-	4

2-Course Aims:

No.	Aims
9	Demonstrate current technical expertise related to electroplating by addressing process dynamic and control challenges in plant operations
10	Apply research findings in chemical reactions related to electroplating to exhibit their properties in order to assess the results and draw conclusions about industrial operations.

3- Competencies:

Competencies	Learning Outcomes (LO'S)
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 electroplating to respond to the challenging role and responsibilities of a professional chemical engineer
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 electroplating systems.

4. Course Contents:

	Topics	Lecture	Exercise	laboratory	Student load
1	Electrochemistry	4	4	-	8
2	Electrochemical cells	6	6	-	12
3	Surface preparation	6	6	-	12
4	Throwing power	2	2	-	4
5	Electrochemical baths	4	4	-	8
6	Factors affecting electroplating	4	4	-	8
7	temperature - bath concentration	2	2	-	4
Total		**28**	**28**	-	**56**

5. Teaching and learning methods:

No	Topics	Face-to-Face Lecture	Online Lecture	Flipped Classroom	Presentation and movies	Discussion	Problem solving	Brain storming	Projects	Site visits	Self-learning and Research	Cooperative	Discovering	Modeling	lab
1	Electrochemistry	x	x	x		x	x								
2	Electrochemical cells	x	x			x	x	x							
3	Surface preparation	x	x			x	x				x				
4	Throwing power	x	x	x		x									
5	Electrochemical baths	x	x			x	x								
6	Factors affecting electroplating	x	x	x							x				
7	temperature - bath concentration	x	x			x	x								

6. Teaching and learning methods for disable students:

No.	Teaching Methods	Reason
1	Presentation of the course in digital material	Better access any time
2	Web communication with students	Better communication with certain cases
3	Asking small groups to do assignments; each composed of low ,medium and high performance students	Knowledge and skills transfer among different levels of students

7. Student evaluation:

7.1 Student Evaluation Method:

No.	Evaluation Method	Competencies	LO's
1	Periodic exams	B4,B2	d1,d1
2	Semester work(sheets, quizzes ,presentation)	B2,B4	d1,d1
3	Final term examination	B2,B4	d1,d1

7.2 Evaluation Schedule:

No.	Evaluation Method	Weeks
1	Periodic exams	8th
2	Student load	2nd -7th - 9th-14th
3	Final term examination	15th

7.3 weighting of Evaluation:

No.	Evaluation method	Marks
1	Periodic exams	30
2	Student load	20
3	Final term examination	50
Total		**100**

8. List of References:

No.	Reference List
1	Zaki Ahmad, Principles of Corrosion Engineering and Corrosion Control, Butterworth - Heinemann, 3rd. Ed., 2019.

9. Facilities required for teaching and learning:

No.	Facility	No.	Facility
1	Lecture classroom	4	Data show system

2	Presenter	5	Sound system
3	White board		

10. Matrix of Competencies and LO's of the course:

No.	Topic	Aims	Competencies	LO's
1	Electrochemistry	9	B2	d1
2	Electrochemical cells	10	B4	d1
3	Surface preparation	9,10	B2	d1
4	Throwing power	9	B4	d1
5	Electrochemical baths	10	B2	d1
6	Factors affecting electroplating	9,10	B4	d1
7	Temperature - bath concentration	9	B2	d1

Course Coordinator: Asso.prof. Hend Elsayed Gadow

Head of Department: Asso.prof. Hend Elsayed Gadow

Date of Approval: 2023

Synthetic Fibers

CHE415B

1-Basic Information:

Program Title	Chemical Engineering Program
Department Offering the Program	Chemical Engineering Department
Department Responsible for the Course	Chemical Engineering Department
Course Title	Synthetic Fibers
Course Code	CHE415B
Year/Level	Level 4
Specialization	Major
Authorization Date of Course Specification	-

Teaching hours	**Lectures**	**Exercise**	**laboratory**	**Student's load**
	2	2	-	4

2-Course Aims:

No.	**Aims**
9	Demonstrate current technical expertise related to synthetic fibers industry by addressing process dynamic and control challenges in plant operations
10	Apply research findings in chemical reactions related to synthetic fibers industry to exhibit their properties in order to assess the results and draw conclusions about industrial operations.

3- Competencies:

Competencies	**Learning Outcomes (LO'S)**
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 synthetic fibers industry to respond to the challenging role and responsibilities of a professional chemical engineer
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 related to synthetic Fibers industry

4. Course Contents:

	Topics	Lecture	Exercise	laboratory	Student load
1	Classification of synthetic fibers	4	4	-	8
2	Properties of fibers	4	4	-	8
3	Polyester	4	4	-	8
4	Nylon 6 and Nylon 6, 6	4	4	-	8
5	Polyacrylic	2	2	-	4
6	Amide fibers and Aramids	4	4	-	8
7	Glass fibers	4	4	-	8
8	Teflon	2	2	-	4
Total		**28**	**28**	**-**	**56**

5. Teaching and learning methods:

No	Topics	Face-to-Face Lecture	Online Lecture	Flipped Classroom	Presentation and movies	Discussion	Problem solving	Brain storming	Projects	Site visits	Self-learning and Research	Cooperative	Discovering	Modeling	lab
1	Classification of synthetic fibers	x	x	x		x					x				
2	Properties of fibers	x	x		x	x					x				
3	Polyester	x	x		x	x					x				
4	Nylon 6 and Nylon 6, 6	x	x	x		x					x				
5	Polyacrylic	x	x	x		x					x				
6	Amide fibers and Aramids	x	x	x		x					x				
7	Glass fibers	x	x	x	x	x					x				

8	Teflon	x	x	x		x					x				

6. Teaching and learning methods for disable students:

No.	Teaching Methods	Reason
1	Presentation of the course in digital material	Better access any time
2	Web communication with students	Better communication with certain cases
3	Asking small groups to do assignments; each composed of low ,medium and high performance students	Knowledge and skills transfer among different levels of students

7. Student evaluation:

7.1 Student evaluation method:

No.	Evaluation Method	Competencies	LO's
1	Periodic exams	B2,B4	d1
2	Semester work(sheets, quizzes, presentation)	B4	d1
3	Final term examination	B2	d1

7.2 Evaluation Schedule:

No.	Evaluation Method	Weeks
1	Periodic exams	Any week
2	Student load	Any week
3	Final term examination	15th

7.3 weighting of Evaluation:

No.	Evaluation Method	Marks
1	Periodic exams	30
2	Student load	20

3	Final term examination	50
Total		**100**

8. List of References:

No.	Reference List
1	High-performance Fibres, J. W. S. Hearle Woodhead Publishing Series in Textiles ISBN (1855735393, 9781855735392),2019
2	Fiber Technology From Film to Fiber, 1st Edition ,By Hans A. Krassig Copyright Year,2019

9. Facilities required for teaching and learning:

No.	Facility	No.	Facility
1	Lecture classroom	4	Data show system
2	Presenter	5	Sound system
3	White board		

10. Matrix of Competencies and LO's of the course:

No.	Topic	Aims	Competencies	LO's
1	Classification of synthetic fibers	10	B4	d1
2	Properties of fibers	10	B4	d1
3	polyester	9	B2	d1
4	Nylon 6 and Nylon 6, 6	9	B2	d1
5	polyacrylic	9	B2	d1
6	Amide fibers and Aramids	9	B2	d1
7	Glass fibers	9	B2	d1
8	Teflon	9	B2	d1

Course Coordinator: Dr. / Yasser Tawfiq

Head of Department: Asso.prof. Hend Elsayed Gadow

Date of Approval: 2023

Paints technology
CHE415C

1-Basic Information:

Program Title	Chemical Engineering Program
Department Offering the Program	Chemical Engineering Department
Department Responsible for the Course	Chemical Engineering Department
Course Title	Paints technology
Course Code	CHE415C
Year/Level	Level4
Specialization	Major
Authorization Date of Course Specification	-

Teaching hours	**Lectures**	**Exercise**	**laboratory**	**Student's load**
	2	2	-	4

2-Course Aims:

No.	**Aims**
9	Demonstrate current technical expertise related to paints industry by addressing process dynamic and control challenges in plant operations
10	Apply research findings in chemical reactions related to synthetic paints industry to exhibit their properties in order to assess the results and draw conclusions about industrial operations.

3 -Competencies:

Competencies	**Learning Outcomes (LO'S)**
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 painting technology to respond to the challenging role and responsibilities of a professional chemical engineer
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 Painting systems.

4. Course Contents:

	Topics	Lecture	Exercise	laboratory	Student load
1	Paints compositions	4	4	-	8
2	Classification of paints	4	4	-	8
3	Primers and final coats	4	4	-	8
4	Surface preparation	8	8	-	16
5	Reaction of paint systems	4	4	-	8
6	Paints for corrosion resistance	4	4	-	8
Total		**28**	**28**	**-**	**56**

5. Teaching and learning methods:

No	Topics	Face-to-Face Lecture	Online Lecture	Flipped Classroom	Presentation and movies	Discussion	Problem solving	Brain storming	Projects	Site visits	Self-learning and Research	Cooperative	Discovering	Modeling	lab
1	Paints compositions	x	x			x									
2	Classification of paints	x	x			x					x				
3	Primers and final coats	x	x	x		x									
4	Surface preparation	x	x			x					x				
5	Reaction of paint systems	x	x	x		x					x				
6	Paints for corrosion resistance	x	x		x						x				

6. Teaching and learning methods for disable students:

No.	Teaching Methods	Reason
1	Presentation of the course in digital material	Better access any time
2	Web communication with students	Better communication with certain cases

3	Asking small groups to do assignments; each composed of low ,medium and high performance students	Knowledge and skills transfer among different levels of students

7. Student evaluation:

7.1 Student Evaluation Method:

No.	Evaluation Method	Competencies	LO's
1	Periodic exams	B4,B2	d1,d1
2	Semester work(sheets, quizzes ,presentation)	B2,B4	d1,d1
3	Final term examination	B2,B4	d1,d1

7.2 Evaluation Schedule:

No.	Evaluation Method	Weeks
1	Periodic exams	8th
2	Student load	2nd -7th - 9th-14th
3	Final term examination	15th

7.3 weighting of Evaluation:

No.	Evaluation method	Marks
1	Periodic exams	30
2	Student load	20
3	Final term examination	50
Total		**100**

8. List of References:

No.	Reference List
1	EIRI Board, "Paint Technology Handbook with Formulations" EIRI Board (2017).
2	Himadri Panda, "Complete Handbook on Paints Varnish Resins Copolymers and Coatings wirh Manufacturing Process Formulations and Technology" Bio-Green Books (2017).

9. Facilities required for teaching and learning:

No.	Facility	No.	Facility
1	Lecture classroom	4	Data show system
2	Presenter	5	Sound system
3	White board		

10. Matrix of Competencies and LO's of the course:

No.	Topic	Aims	Competencies	LO's
1	Paints compositions	9,10	B2	d1
2	Classification of paints	9,10	B4	d1
3	Primers and final coats	9,10	B2	d1
4	Surface preparation	9,10	B2	d1
5	Reaction of paint systems	9,10	B4	d1
6	Paints for corrosion resistance	9,10	B2	d1

Course Coordinator: Asso.prof. Hend Elsayed Gadow
Head of Department: Asso.prof. Hend Elsayed Gadow
Date of Approval: 2023

Renewable Energy Sources
CHE415D

1-Basic Information:

Program Title	Chemical Engineering Program
Department Offering the Program	Chemical Engineering Department
Department Responsible for the Course	Chemical Engineering Department
Course Title	Renewable Energy Sources Elective
Course Code	CHE415D
Year/Level	Level4
Specialization	Major
Authorization Date of Course Specification	-

Teaching hours	Lectures	Exercise	laboratory	Student's load
	2	2	-	4

2-Course Aims:

No.	Aims
9	Demonstrate current technical expertise related to Renewable Energy Sources by addressing process dynamic and control challenges in plant operations
10	Apply research findings in chemical reactions related to Renewable Energy Sources to exhibit their properties in order to assess the results and draw conclusions about industrial operations.

3 -Competencies:

Competencies	Learning Outcomes (LO'S)
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 Renewable Energy Sources to respond to the challenging role and responsibilities of a professional chemical engineer
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 Renewable Energy Sources.

4. Course Contents:

	Topics	Lecture	Exercise	laboratory	Student load
1	Fossil fuel vs. renewable energy sources	4	4	-	8
2	solar energy and its applications	4	4	-	8
3	wind power	4	4	-	8
4	hydropower	8	8	-	16
5	geothermal energy	4	4	-	8
6	municipal solid waste and biomass	2	2	-	4
7	ocean energy	2	2		4
Total		**28**	**28**	-	**56**

5. Teaching and learning methods:

No	Topics	Face-to-Face Lecture	Online Lecture	Flipped Classroom	Presentation and movies	Discussion	Problem solving	Brain storming	Projects	Site visits	Self-learning and Research	Cooperative	Discovering	Modeling	lab
1	Fossil fuel vs. renewable energy sources	x	x			x									
2	solar energy and its applications	x	x			x					x				
3	wind power	x	x	x		x									
4	hydropower	x	x			x					x				
5	geothermal energy	x	x	x		x					x				
6	municipal solid waste and biomass	x	x		x						x				
7	ocean energy	x	x		x						X				

6. **Teaching and learning methods for disable students:**

No.	Teaching Methods	Reason
1	Presentation of the course in digital material	Better access any time
2	Web communication with students	Better communication with certain cases
3	Asking small groups to do assignments; each composed of low ,medium and high performance students	Knowledge and skills transfer among different levels of students

7. **Student evaluation:**

7.1 Student Evaluation Method:

No.	Evaluation Method	Competencies	LO's
1	Periodic exams	B4,B2	d1,d1
2	Semester work(sheets, quizzes ,presentation)	B2,B4	d1,d1
3	Final term examination	B2,B4	d1,d1

7.2 Evaluation Schedule:

No.	Evaluation Method	Weeks
1	Periodic exams	8th
2	Student load	2nd -7th - 9th-14th
3	Final term examination	15th

7.3 weighting of Evaluation:

No.	Evaluation method	Marks
1	Periodic exams	30
2	Student load	20
3	Final term examination	50
Total		**100**

8. **List of References:**

No.	Reference List
1	Renewable Energy Resources, John Twidell,Taylor & Francis ,2021

9. Facilities required for teaching and learning:

No.	Facility	No.	Facility
1	Lecture classroom	4	Data show system
2	Presenter	5	Sound system
3	White board		

10. Matrix of Competencies and LO's of the course:

No.	Topic	Aims	Competencies	LO's
1	Fossil fuel vs. renewable energy sources	9,10	B2	d1
2	solar energy and its applications	9,10	B4	d1
3	wind power	9,10	B2	d1
4	hydropower	9,10	B2	d1
5	geothermal energy	9,10	B4	d1
6	municipal solid waste and biomass	9,10	B2	d1
7	ocean energy	9,10	B4	d1

Course Coordinator: Asso.prof. Hend Elsayed Gadow
Head of Department: Asso.prof. Hend Elsayed Gadow
Date of Approval: 2023

Water Desalination

CHE416A

1-Basic Information:

Program Title	Chemical Engineering Program
Department Offering the Program	Chemical Engineering Department
Department Responsible for the Course	Chemical EngineeringDepartment
Course Title	Water Desalination
Course Code	CHE416A
Year/Level	Level4
Specialization	Major
Authorization Date of Course Specification	-

Teaching hours	Lectures	Exercise	laboratory	Student's load
	2	2	-	4

2-Course Aims:

No.	Aims
6	Analyze data from the intended tests to manage resources creatively.
8	Consider the impact of water desalination on society, economics, and the environment using fundamental knowledge of chemical process industries.

3- Competencies:

Competencies	Learning Outcomes (LO'S)
A4 . Utilize contemporary technologies, codes of practice and standards, quality guidelines, health and safety requirements, environmental issues and risk management principles.	**a1** Describe health and safety regulations and environmental concerns related to water desalination **c1** Apply safe systems at work by taking the necessary precautions to manage hazards. **c3** Utilize modern technologies related to water desalination

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.	**b1** Summarize the appropriate techniques relevant to water desalination. **c1** Create a process, component or system to carry out specialized engineering designs related to water desalination.

4-Course Contents:

No.	Topics	Lecture	Exercise	laboratory	Student load
1	Basic concept of water desalination and combines water chemistry, scaling, corrosion, heat transfer principles and material behavior.	6	6	-	12
2	Design principles as applied to desalination processes.	8	8	-	16
3	Thermal (flash, vapor compression) and non-thermal (reverse-osmosis, electro dialysis) desalination techniques.	8	8	-	16
4	Water properties and quality criteria and standards as well as corrosion behavior and its control in desalination plants.	6	6	-	16
Total		**28**	**28**	**-**	**56**

5. Teaching and learning methods:

No	Topics	Face-to-Face Lecture	Online Lecture	Flipped Classroom	Presentation and movies	Discussion	Problem solving	Brain storming	Projects	Site visits	Self-learning and Research	Cooperative	Discovering	Modeling	lab
1	Basic concept of water desalination and combines water chemistry, scaling, corrosion, heat transfer principles	x	x			x					x				
	and material behavior.														
2	Design principles as applied to desalination processes.	x	x			x									
3	Thermal (flash, vapor compression) and non-thermal (reverse-osmosis, electro - dialysis) desalination techniques.	x	x			x	x								
4	Water properties and quality criteria and standards as well as corrosion behavior and its control in desalination plants.	x	x			x	x	x							

6. Teaching and learning methods for disable students:

No.	Teaching Methods	Reason
1	Presentation of the course in digital material	Better access any time
2	Web communication with students	Better communication with certain cases
3	Asking small groups to do assignments; each composed of low ,medium and high performance students	Knowledge and skills transfer among different levels of students

7. Student evaluation:

7.1 Student evaluation method:

No.	Evaluation Method	Competencies	LO's
1	Periodic exams	A4	a1,c1,c3
2	Semester work (sheets, quizs, reports)	A4, B1	a1,c1,c3/b1,c1
3	Final term examination	B1,A4	b1,c1/c2,c3

7.2 Evaluation Schedule:

No.	Evaluation Method	Weeks
1	Periodic exams	8th
2	Student load	2nd -7th - 9th-14th
3	Final term examination	15th

7.3 weighting of Evaluation:

No.	Evaluation method	Marks
1	Periodic exams	30
2	Student load	20
3	Final term examination	50
Total		**100**

8. List of References:

No.	Reference List
1	H.T. El-Dessouky, H.M. Ettouney, Fundamentals of Salt Water Desalination, Elsevier Science, 2019.
2	Noam Lior, Advances in water desalination, Wiley, 2018.

9. Facilities required for teaching and learning:

No.	Facility	No.	Facility
1	Lecture classroom	4	Data show system
2	Presenter	5	Sound system
3	White board		

10. Matrix of Competencies and LO's of the course:

No.	Topic	Aims	Competencies	LO's
1	Basic concept of water desalination and combines water chemistry, scaling, corrosion, heat transfer principles and material behavior.	8	A4	a1,c1
2	Design principles as applied to desalination processes.	8,6	A4	a1,c1,c3
3	Thermal (flash, vapor compression) and nonthermal (reverse-osmosis, electro -dialysis) desalination techniques.	6	B1	b1,c1
4	Water properties and quality criteria and standards as well as corrosion behavior and its control in desalination plants.	6	B1	b1,c1

Course Coordinator: Dr. / Yasser Tawfiq
Head of Department: Asso.prof. Hend Elsayed Gadow
Date of Approval: 2023

Wastewater treatment

CHE416B

1-Basic Information:

Program Title	Chemical Engineering Program
Department Offering the Program	Chemical Engineering Department
Department Responsible for the Course	Chemical Engineering Department
Course Title	Wastewater treatment
Course Code	CHE416B
Year/Level	Level4
Specialization	Major
Authorization Date of Course Specification	-

Teaching hours	Lectures	Exercise	laboratory	Student's load
	2	2	-	4

2-Course Aims:

No.	Aims
6	Analyze data from the intended tests to manage resources creatively.
8	Consider the impact of Wastewater treatment on society, economics, and the environment using fundamental knowledge of chemical process industries.

3- Competencies:

Competencies	Learning Outcomes (LO'S)
A4 . Utilize contemporary technologies, codes of practice and standards, quality guidelines, health and safety requirements, environmental issues and risk management principles.	**a1** Describe health and safety regulations and environmental concerns related to wastewater treatment. **c1** Apply safe systems at work by taking the necessary precautions to manage hazards. **c3** Utilize modern technologies related to wastewater treatment

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.	**b1** Summarize the appropriate techniques relevant to wastewater treatment. **c1** Create a process, component or system to carry out specialized engineering designs related to wastewater treatment.

4. Course Contents:

	Topics	**Lecture**	**Exercise**	**laboratory**	**Student load**
1	Water chemistry	4	2	-	6
2	Water sampling	6	2	-	8
3	Water analysis	8	24	-	20
4	Wastewater treatment technologies	10	-	-	22
	Total	**28**	**28**	-	**56**

5. Teaching and learning methods:

No	**Topics**	**Face-to-Face Lecture**	**Online Lecture**	**Flipped Classroom**	**Presentation and movies**	**Discussion**	**Problem solving**	**Brain storming**	**Projects**	**Site visits**	**Self-learning and Research**	**Cooperative**	**Discovering**	**Modeling**	**lab**
1	Water chemistry	**x**	**x**			**x**	**x**								
2	Water sampling	**x**	**x**			**x**	**x**				**x**				
3	Water analysis	**x**	**x**			**x**	**x**	**x**							

4	Wastewater treatment technologies	x	x	x		x	x				x				

6. **Teaching and learning methods for disable students:**

No.	Teaching Methods	Reason
1	Presentation of the course in digital material	Better access any time
2	Web communication with students	Better communication with certain cases
3	Asking small groups to do assignments; each composed of low ,medium and high performance students	Knowledge and skills transfer among different levels of students

7. **Student evaluation:**

7.1 Student Evaluation Method:

No.	Evaluation Method	Competencies	LO's
1	Periodic exams	B1,A4	b1,c1,a1
2	Semester work (sheets, quizzes, presentation)	B1,A4	c1,c3
3	Final term examination	B1/A4	b1,c1/a1

7.2 Evaluation Schedule:

No.	Evaluation Method	Weeks
1	Periodic exams	8th
2	Student load	2nd -7th - 9th-14th
3	Final term examination	15th

7.3 weighting of Evaluation:

No.	Evaluation method	Marks
1	Periodic exams	30
2	Student load	20
3	Final term examination	50
Total		**100**

8. **List of References:**

No.	Reference List

1	R. A. Mansour, N. M. Aboeleneen & Nabil M. AbdelMonem, Adsorption of cationic dye from aqueous solutions by date pits: Equilibrium, kinetic, thermodynamic studies, and batch adsorber design, International Journal of Phytoremediation, 20,1062, 2018.
2	Mu. Naushad, Eric Lichtfouse "Green Materials for Wastewater Treatment" Springer , (2020).

9. Facilities required for teaching and learning:

No.	Facility	No.	Facility
1	Lecture classroom	4	Data show system
2	Presenter	5	Sound system
3	White board		

10. Matrix of Competencies and LO's of the course:

No.	Topic	Aims	Competencies	LO's
1	Water chemistry	6	B1	b1
2	Water sampling	6	A4	a1,c1,c3
3	Water analysis	8	B1	b1
4	Wastewater treatment technologies	8	B1	b1,c1

Course Coordinator: Dr. / Ramadan El kateb

Head of Department: Asso.prof. Hend Elsayed Gadow

Date of Approval: 2023

Rubber industry
CHE416C

1-Basic Information:

Program Title	Chemical Engineering Program
Department Offering the Program	Chemical Engineering Department
Department Responsible for the Course	Chemical Engineering Department
Course Title	Rubber industry
Course Code	CHE416C
Year/Level	Level 4
Specialization	Major
Authorization Date of Course Specification	-

Teaching hours	Lectures	Exercise	laboratory	Student's load
	2	2	-	4

2-Course Aims:

No.	Aims
6	Analyze data from the intended tests to manage resources creatively.
8	Consider the impact of rubber industry on society, economics, and the environment using fundamental knowledge of chemical process industries.

3- Competencies:

Competencies	Learning Outcomes (LO'S)
A4 . Utilize contemporary technologies, codes of practice and standards, quality guidelines, health and safety requirements, environmental issues and risk management principles.	**a1** Describe health and safety regulations and environmental concerns related to rubber industry **c1** Apply safe systems at work by taking the necessary precautions to manage hazards. **c3** Utilize modern technologies related to rubber industry

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.	**b1** Summarize the appropriate techniques relevant to rubber industry. **c1** Create a process, component or system to carry out specialized engineering designs related to rubber industry.

4-Course Contents:

	Topics	Lecture	Exercise	laboratory	Student load
1	Natural rubber	2	2	-	4
2	Polyisoprene rubber	2	2	-	4
3	Synthetic rubbers	8	8	-	16
4	Types of elastomers	8	8	-	16
5	chemical vulcanization reaction	6	6	-	12
6	Acrylonitrile butadiene styrene (ABS)	2	2	-	4
Total		**28**	**28**	-	**56**

5. Teaching and learning methods:

No	Topics	Face-to-Face Lecture	Online Lecture	Flipped Classroom	Presentation and movies	Discussion	Problem solving	Brain storming	Projects	Site visits	Self-learning and Research	Cooperative	Discovering	Modeling	lab
1	Natural rubber	x	x	x	x	x					x				

2	Polyisoprene rubber	x	x	x	x	x					x				
3	Synthetic rubbers	x	x	x	x	x					x				
4	Types of elastomers	x	x	x	x	x					x				
5	chemical vulcanization reaction	x	x	x	x	x					x				
6	Acrylonitrile butadiene styrene (ABS)	x	x	x	x	x					x				

6. Teaching and learning methods for disable students:

No.	Teaching Methods	Reason
1	Presentation of the course in digital material	Better access any time
2	Web communication with students	Better communication with certain cases
3	Asking small groups to do assignments; each composed of low ,medium and high performance students	Knowledge and skills transfer among different levels of students

7. Student evaluation:

7.1 Student evaluation method:

No.	Evaluation Method	Competencies	LO’s
1	Periodic exams	A4	a1,c1,c3
2	Semester work(sheets, quizzes, presentation)	B1	b1,c1
3	Final term examination	B1	b1,c1

7.2 Evaluation Schedule:

No.	Evaluation Method	Weeks
1	Periodic exams	Any week
2	Student load	Any week
3	Final term examination	15^{th}

7.3 weighting of Evaluation:

No.	Evaluation method	Marks
1	Periodic exams	30

2	Student load	20
3	Final term examination	50
Total		**100**

8. List of References:

No.	Reference List
1	Rubber Technology 3E: Compounding and Testing for Performanceby John S. Dick | Nov 30, 2018
2	Notes on Rubber-Cultivation: With Special Reference to Portuguese India (Classic Reprint) Paperback – March 11, 2018

9. Facilities required for teaching and learning:

No.	Facility	No.	Facility
1	Lecture classroom	4	Data show system
2	Presenter	5	Sound system
3	White board		

10. Matrix of Competencies and LO's of the course:

No.	Topic	Aims	Competencies	LO's
1	Natural rubber	6,8	B1	b1,c1
2	Polyisoprene rubber	6,8	A4	a1,c1,c3
3	Synthetic rubbers	6,8	B1	b1,c1
4	Types of elastomers	6,8	B1	b1,c1
5	chemical vulcanization reaction	6,8	B1	b1,c1
6	Acrylonitrile butadiene styrene (ABS)	6,8	B1	b1,c1

Course Coordinator: Asso.prof. Hend Elsayed Gadow

Head of Department: Asso.prof. Hend Elsayed Gadow

Date of Approval: 2023

Research and Analytic Skills

BAS421

1-Basic Information:

Program Title	Chemical Engineering Program
Department Offering the Program	Chemical Engineering Department
Department Responsible for the Course	Basic science and engineering Department
Course Title	Research and Analytic Skills
Course Code	BAS421
Year/Level	Level 4
Specialization	Major
Authorization Date of Course Specification	-

Teaching hours	Lectures	Exercise	laboratory	Student's load
	2	-	-	3

2-Course Aims:

No.	Aims
1	Master a wide range of engineering knowledge and specialized skills, as well as the ability to apply that information in real-world situations using theories and analytical thinking.

3- Competencies:

Competency	Learning Outcomes (LO'S)
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.	**b3.** Analyze and interpret data. **c3.** Applying statistical analyses and objective engineering judgment to draw conclusions.

4-Course Contents:

No.	Topics	Lecture	Exercise	laboratory	Student load
1	ارات التحليل: إطار التحليل للمسائل الهندسية مع الاخذ الاعتبار النواحي الفنية، الاقتصادية ،البيئية، والاخلاقية.	4	-	-	6

2	أطوار حل المسائل)فهم المسألة وصياغتها، خطة الحل، تنفيذ الخطة، التقيم، والمراجعة.(دور الابداع في التحليل.	6	-	-	6
3	أوجه القوة، أوجة الضعف ، (SWOTتحليل الفرص، والمخاطر(بالنسبة للبدائل المختلفة. التحليل التفصيلي للتكلفة-الفائدة، وكذلك تحليل المخاطرز دور التعاون وعمل الفريق في تحليل المسائل الكبيرة.	6	-	-	9
4	اهمية العثور علي البيانات والمعلومات والمعارف المناسبة.	4	-	-	9
5	. مهارات البحث: الطرق الاساسية للبحث باستخدام ()كيفية AND,OR,NOTالروابط المنطيقية مثل) البحث باستخدام العبارات، العناوين،المجال، الحاسب المضيف ، URL.وكذلك الروابط	4	-	-	6
6	تقييم نتائج البحث اختيار محرك البحث المناسب . أهمية تقييم مصداقية الاماكن المتاحة علي الشبكة المعرفية العالمية.	4	-	-	6
Total		**28**	**-**	**-**	**42**

5. Teaching and learning methods:

No	Topics	Face-to-Face Lecture	Online Lecture	Flipped Classroom	Presentation and movies	Discussion	Problem solving	Brain storming	Projects	Site visits	Self-learning and Research	Cooperative	Discovering	Modeling	lab
1	مهارات التحليل: إطار التحليل للمسائل الهندسية مع الاخذ في الاعتبار النواحي الفنية، الاقتصادية، البيئية ، والاخلاقية .	x	x	x		x	x			x					

2	أطوار حل المسائل)فهم المسألة وصياغتها، خطة الحل، تنفيذ الخطة ،التقيم ،والمراجعة.(دور الابداع في التحليل.	x	x			x	x	x		x	x				
3	أوجه (SWOTتحليل القوة، أوجة الضعف ، الفرص، والمخاطر(بالنسبة	x	x			x	x				x				
	للبدائل المختلفة. التحليل التفصيلي للتكلفة-الفائدة ، وكذلك تحليل المخاطرز دور التعاون وعمل الفريق في تحليل المسائل الكبيرة.														
4	اهمية العثور علي البيانات والمعلومات والمعارف المناسبة.	x	x	x		x									
5	. مهارات البحث: الطرق الاساسية للبحث باستخدام الروابط المنطقية مثل (AND,OR,NOT كيفية() البحث باستخدام العبارات ،العناوين،المجال، الحاسب المضيفURL وكذلك ، الروابط.	x	x			x	x		x						
6	تقييم نتائج البحث اختيار محرك البحث المناسب أهمية تقييم مصداقية الاماكن. المتاحة علي الشبكة المعرفية العالمية.	x	x	x					x		x				

6. Teaching and learning methods for disable students:

No.	Teaching Methods	Reason
1	Presentation of the course in digital material	Better access any time
2	communication with students	Better communication with certain cases
3	Asking small groups to do assignments; each composed of low ,medium and high performance students	Knowledge and skills transfer among different levels of students

7. Student evaluation:

7.1 Student evaluation method:

No.	Evaluation Method	Competencies	LO's
1	Periodic exams	A2	b3,c3
2	Semester work(sheets, quizzes ,presentation)	A2	b3,c3
3	Final term examination	A2	b3,c3

7.2 Evaluation Schedule:

No.	Evaluation Method	Weeks
1	Periodic exams	8th
2	Student load	2nd -7th - 9th -14th
3	Final term examination	15th

7.3 weighting of Evaluation:

No.	Evaluation Method	Marks
1	Periodic exams	10
2	Student load	10
4	Final term examination	30
Total		**50**

8. List of References:

No.	Reference List
1	Analytical Tools in Research,L N Pattanaik, Educreation Publishing, Feb 23, 2017

9. Facilities required for teaching and learning:

No.	Facility	No.	Facility
1	Lecture classroom	4	Data show system
2	Presenter	5	Wireless internet
3	White board	6	Sound system

10. Matrix of Competencies and LO's of the course:

No.	Topic	Aims	Competencies	LO's
1	مهارات التحليل: إطار التحليل للمسائل الهندسية مع الاخذ في الاعتبار النواحي الفنية، الاقتصادية، البيئية، والاخلاقية .	1	A2	b3,c3
2	أطوار حل المسائل)فهم المسألة وصياغتها، خطة الحل، تنفيذ الخطة، التقيم ، والمراجعة.(دور الابداع في التحليل.	1	A2	b3,c3

3	تحليل(SWOT أوجه القوة، أوجة الضعف ، الفرص، والمخاطر(بالنسبة للبدائل المختلفة. التحليل التفصيلي للتكلفة-الفائدة، وكذلك تحليل المخاطرز دور التعاون وعمل الفريق في تحليل المسائل الكبيرة.	1	A2	b3,c3
4	اهمية العثور علي البيانات والمعلومات والمعارف المناسبة.	1	A2	b3,c3
5	. مهارات البحث: الطرق الاساسية للبحث باستخدام الروابط المنطيقية مثل ()كيفية البحث باستخدام العبارات، العناوين،المجال ،AND,OR,NOT) وكذلك الروابط.URLالحاسب المضيف ،	1	A2	b3,c3
6	تقييم نتائج البحث اختيار محرك البحث المناسب. أهمية تقييم مصداقية الاماكن المتاحة علي الشبكة المعرفية العالمية.	1	A2	b3,c3

Course Coordinator: Asso.prof. Hend Elsayed Gadow

Head of Department: Asso.prof. Hend Elsayed Gadow

Date of Approval: 2023

Industrial Technologies in Chemical Engineering

CHE421

1- Basic Information:

Program Title	Chemical Engineering Program
Department Offering the Program	Chemical Engineering Department
Department Responsible for the Course	Chemical Engineering Department
Course Title	Industrial Technologies in Chemical Engineering
Course Code	CHE421
Year/Level	Level 4
Specialization	Major
Authorization Date of Course Specification	-

Teaching hours	**Lectures**	**Exercise**	**laboratory**	**Student's load**
	2	2	-	4

2-Course Aims:

No.	Aims
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;
9	Consider the impact of chemical process industries on society, economics, and the environment using fundamental knowledge of chemical process industries.

3- Competencies:

Competencies	Learning Outcomes (LO'S)

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.implementation of engineering projects, taking into consideration other trades requirements	**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.
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.

4-Course Contents:

No.	Topics	Lecture	Exercise	laboratory	Student load
1	Introduction of the main basics and concepts of chemical industries	4	4	-	8
2	Industries on chemical creation of some aromatic compounds involving nitration and Sulphonation.	6	6	-	8
3	Industries on chemical creation of some	4	4	-	8

	aromatic compounds involving halogenation and oxidation.				
4	Some chemical industries that concern with polymerization process	4	4	-	8
5	Flow charts of some chemical industries	6	6	-	8
6	Study of chemical industry on some knitting of some natural fibers as cotton and wool.	4	4	-	8
Total		**28**	**28**	-	**56**

5. **Teaching and learning methods:**

No	**Topics**	**Face-to-Face Lecture**	**Online Lecture**	**Flipped Classroom**	**Presentation and**	**Discussion**	**Problem solving**	**Brain storming**	**Projects**	**Site visits**	**Self-learning and**	**Cooperative**	**Discovering**	**Modeling**	**lab**
1	Introduction of the main basics and concepts of chemical industries	**x**	**x**			**x**									**x**
2	Industries on chemical creation of some aromatic compounds involving nitration and Sulphonation.	**x**	**x**				**x**								**x**
3	Industries on chemical creation of some	**x**	**x**				**x**								**x**

	aromatic compounds involving halogenation and oxidation.														
4	Some chemical industries that concern with polymerization process	x	x				x	x							x
5	Flow charts of some chemical industries	x	x			x		x							x
6	Study of chemical industry on some knitting of some natural fibers as cotton and wool.	x	x			x	x	x							x

6. Teaching and learning methods for disable students:

No.	Teaching Methods	Reason
1	Presentation of the course in digital material	Better access any time
2	Web communication with students	Better communication with certain cases
3	Asking small groups to do assignments; each composed of low ,medium and high performance students	Knowledge and skills transfer among different levels of students

7. Student evaluation:

7.1 Student Evaluation Method:

No.	Evaluation Method	Competencies	LO’s
1	Periodic exams	B1	a1,b1,c1

2	Semester work (sheets, quizs)	B1,A3	a1,b1,c1,a2,a3
3	Practical Examination	B1,A3	c1,a2,a3
4	Final term examination	B1/A3	a1,b1, c1/a2,a3,b1,c1

7.2 Evaluation Schedule:

No.	Evaluation Method	Weeks
1	Periodic exams	8th
2	Student load	2nd -7th - 9th
3	Practical Examination	14th
4	Final term examination	15th

7.3 weighting of Evaluation:

No.	Evaluation method	Marks
1	Periodic exams	30
2	Student load	20
3	Practical Examination	15
4	Final term examination	60
Total		**125**

8. List of References:

No.	Reference List
1	Hussein K. Abdel-Aal, Chemical Engineering Primer with Computer Applications , 2017,CRC Press.

9. Facilities required for teaching and learning:

No.	Facility	No.	Facility
1	Lecture classroom	5	Data show system
2	Presenter	6	Sound system
3	White board		
4	Lab		

10. Matrix of Competencies and LO's of the course:

No.	Topic	Aims	Competencies	LO’s
1	Introduction of the main basics and concepts of chemical industries	3,9	A3	a2,a3
2	Industries on chemical creation of some aromatic compounds involving nitration and Sulphonation.	3,9	A3	b1
3	Industries on chemical creation of some aromatic compounds involving halogenation and oxidation.	3,9	B1	a1
4	Some chemical industries that concern with polymerization process	3,9	B1	a1
5	Flow charts of some chemical industries	3,9	B1	c1
6	Study of chemical industry on some knitting of some natural fibers as cotton and wool.	3,9	B1	b1,c1

Course Coordinator: Dr. / Yasser tawfik
Head of Department: Asso.prof. Hend Elsayed Gadow
Date of Approval: 2023

Petroleum Refining Engineering
CHE422

1-Basic Information:

Program Title	Chemical Engineering Program
Department Offering the Program	Chemical Engineering Department
Department Responsible for the Course	Chemical Engineering Department
Course Title	Petroleum Refining Engineering
Course Code	CHE422
Year/Level	Level 4
Specialization	Major
Authorization Date of Course Specification	-

Teaching hours	**Lectures**	**Exercise**	**laboratory**	**Student's load**
	2	2	-	3

2-Course Aims:

No.	Aims
4	Use the techniques, skills, and current engineering tools required for petroleum refining 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.
9	Demonstrate current technical expertise by addressing process dynamic and control challenges in plant operations.

3- Competencies:

Competencies	Learning Outcomes (LO'S)
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** Professionally merge the petroleum refining engineering knowledge, understanding, and feedback to improve design, products and/or services.

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 petroleum refining 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 petroleum refining. **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** Participate in recent technical advancements and developing disciplines pertinent to Petroleum Refining Engineering in order to respond to the demanding role and responsibilities of a professional chemical engineer.

4. **Course Contents:**

No.	Topics	Lecture	Exercise	laboratory	Student load
1	Classification of Crude Oils, Composition o Crude Oils	2	2	-	3
2	Physical and Chemical Properties of Crude oil and Oil Products	2	2	-	3
3	Evaluation of Crude Oil	2	2	-	3
4	Crude Oil Pre-treatment, Fractionation of Crude Oil (Atmospheric Vacuum Distillation, Light End Fractionation, Process Description)	4	4	-	6
5	Thermal Cracking and Coking Processes	2	2	-	3
6	Catalytic Operations (Processes and calculations) - (Fluid Catalytic Cracking, Hydrocracking, Hydrotreating, Catalytic Reforming, Isomerization, Alkylation, Catalytic Dewaxing)	4	4	-	6
7	Chemical Treatment of Oil Products	2	2	-	3

8	Lubricating Oils (Specifications, Production Process, Calculations)	2	2	-	3
9	Solvent Refining (Solvent Deasphalting, Solvent Extraction, Solvent Dewaxing, Wax Deoiling)	2	2		3
10	Oil Products – Properties and Specifications, Description of Process Flow and Calculations- (Oil Gases, Gasoline, Kerosene, Jet Fuel, Gas Oil, Diesel Oil, Fuel Oil, Asphalt, Greases and Wax)	4	4		6
11	Safety and Environmental Aspects in Refining (Air Quality, Sulfur Recovery, Wastes in Refinery Units, Fugitive Emissions)	2	2		3
Total		**28**	**28**	**-**	**42**

5. Teaching and learning methods:

No	Topics	Face-to-Face Lecture	Online Lecture	Flipped Classroom	Presentation and movies	Discussion	Problem solving	Brain storming	Projects	Site visits	Self-learning and Research	Cooperative	Discovering	Modeling	lab
1	Classification of Crude Oils, Composition of Crude Oils	x	x			x									
2	Physical and Chemical Properties of Crude oil and Oil Products	x	x			x	x								

3	Evaluation of Crude Oil	x	x			x	x								
4	Crude Oil Pretreatment, Fractionation of Crude Oil (Atmospheric Vacuum Distillation, Light End Fractionation, Process Description)	x	x			x	x								
5	Thermal Cracking and Coking Processes	x	x			x									
6	Catalytic Operations (Processes and calculations) - (Fluid Catalytic Cracking, Hydrocracking, Hydrotreating, Catalytic Reforming, Isomerization, Alkylation, Catalytic Dewaxing)	x	x			x					x				
7	Chemical Treatment of Oil Products	x	x	x	x										
8	Lubricating Oils (Specifications, Production Process, Calculations)	x	x			x									
9	Solvent Refining (Solvent Deasphalting, Solvent Extraction, Solvent Dewaxing, Wax Deoiling)	x	x			x									

10	Oil Products – Properties and Specifications, Description of Process Flow and Calculations-(Oil Gases, Gasoline, Kerosene, Jet Fuel, Gas Oil, Diesel Oil, Fuel Oil, Asphalt, Greases	x	x			x	x								
	and Wax)														
11	Safety and Environmental Aspects in Refining (Air Quality, Sulfur Recovery, Wastes in Refinery Units, Fugitive Emissions)	x	x	x		x									

6. Teaching and learning methods for disable students:

No.	Teaching Methods	Reason
1	Presentation of the course in digital material	Better access any time
2	Web communication with students	Better communication with certain cases
3	Asking small groups to do assignments; each composed of low ,medium and high performance students	Knowledge and skills transfer among different levels of students

7. Student evaluation:

7.1 Student Evaluation Method:

No.	Evaluation Method	Competencies	LO's
1	Periodic exams	B1	a1,b1
2	Semester work (sheets, quizs)	A10,B1,B2	d1,d2,c1, d1
3	Final term examination	B1	a1,b1,c1

7.2 Evaluation Schedule:

No.	Evaluation Method	Weeks
1	Periodic exams	8th
2	Student load	2nd -7th - 9th -14th
3	Final term examination	15th

7.3 weighting of Evaluation:

No.	Evaluation method	Marks
1	Periodic exams	30
2	Student load	20
3	Final term examination	75
Total		**125**

8. List of References:

No.	Reference List
1	Y. A. Liu, Ai-Fu Chang,Kiran Pashikanti"Petroleum Refinery Process Modeling: Integrated Optimization Tools and Applications" (2018).
2	A. Kayode Coker "Petroleum Refining Design and Applications Handbook, Volume 1" Scrivener Publishing LLC (2018).

9. Facilities required for teaching and learning:

No.	Facility	No.	Facility
1	Lecture classroom	4	Data show system
2	Presenter	5	Sound system
3	White board		

10. Matrix of Competencies and LO’s of the course:

No.	Topic	Aims	Competencies	LO’s
1	Classification of Crude Oils, Composition of Crude Oils	4	A10	d1
2	Physical and Chemical	4	A10	d1

	Properties of Crude oil and Oil Products			
3	Evaluation of Crude Oil	4	B1	b1
4	Crude Oil Pre-treatment, Fractionation of Crude Oil (Atmospheric Vacuum Distillation, Light End Fractionation, Process Description)	9	B1	a1
5	Thermal Cracking and Coking Processes	9	B1	c1
6	Catalytic Operations (Processes and calculations) - (Fluid Catalytic Cracking, Hydrocracking, Hydrotreating, Catalytic Reforming, Isomerization, Alkylation, Catalytic Dewaxing)	9	B1	c1
7	Chemical Treatment of Oil Products	9	A10	d2
8	Lubricating Oils (Specifications, Production Process, Calculations)	4	B2	d1
9	Solvent Refining (Solvent Deasphalting, Solvent Extraction, Solvent Dewaxing, Wax Deoiling)	4	B2	d1

10	Oil Products – Properties and Specifications, Description of Process Flow and Calculations-(Oil Gases, Gasoline, Kerosene, Jet Fuel, Gas Oil, Diesel Oil, Fuel Oil, Asphalt, Greases and Wax)	9	B1	c1
11	Safety and Environmental Aspects in Refining (Air Quality, Sulfur Recovery, Wastes in Refinery Units, Fugitive Emissions)	9	B1	b1

Course Coordinator: Dr. / Sohier Abo Bakr
Head of Department: Asso.prof. Hend Elsayed Gadow
Date of Approval: 2023

Quality Assurances and Engineering Reliability

CHE423

1-Basic Information:

Program Title	Chemical EngineeringProgram
Department Offering the Program	Chemical Engineering Department
Department Responsible for the Course	Basic science and engineering Department
Course Title	Quality Assurances and Engineering Reliability
Course Code	CHE423
Year/Level	Level 4
Specialization	Major
Authorization Date of Course Specification	-

Teaching hours	**Lectures**	**Exercise**	**laboratory**	**Student's load**
	2	1	-	3

2-Course Aims:

No.	**Aims**
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.
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.
6	Analyze data from the intended tests to manage resources creatively.

3- Competencies:

Competencies	**Learning Outcomes (LO'S)**

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. **b1** Create methodical approaches when dealing with new and advancing technology. **c2** Use fundamental organizational and project management abilities. **c4** Apply quality assurance procedures and follow codes and standards.
A6. Plan, supervise and monitor implementation of engineering projects, taking into consideration other trades requirements.	**b1** interpret data derived from laboratory observation from equipment flow sheets, charts and curves to interpret data derived from laboratory observation. Analyze and interpret data. **c2** Acquire entrepreneurial skills.

4- Course Contents:

No.	Topics	Lecture	Exercise	laboratory	Student load
1	The meaning of standardization and its methods	2	1	-	3
2	Define of STM, CAS, ISO, GMP, quality control and quality assurance.	6	3	-	8
3	Standardization of gases and their applications according to standard	2	1	-	3
4	Standardization of liquids and their applications according to standard	4	2	-	6
5	Standardization of materials and their applications according to standard	6	3	-	8
6	Standardization of tools , pipe lines and their applications according to standard	2	1	-	3
7	Standardization of instruments and reactors and their applications according to standard	2	1	-	3
8	Methods of quality control	2	1	-	5
9	Reliability on product quality.	2	1		3

Total	**28**	**14**	**-**	**42**

5. Teaching and learning methods:

No	Topics	Face-to-Face Lecture	Online Lecture	Flipped Classroom	Presentation and movies	Discussion	Problem solving	Brain storming	Projects	Site visits	Self-learning and Research	Cooperative	Discovering	Modeling	lab
1	The meaning of standardization and its methods	x	x			x									
2	Define of STM, CAS, ISO, GMP, quality control and quality assurance.	x	x	x		x					x				
3	Standardization of gases and their applications according to standard	x	x			x									
4	Standardization of liquids and their applications according to standard	x	x			x									
5	Standardization of materials and their applications according to standard	x	x			x									

6	Standardization of tools , pipe lines and their applications according to standard	x	x			x	x				x				
7	Standardization of instruments and reactors and their applications according to standard	x	x			x	x								
8	Methods of quality control	x	x			x	x								
9	Reliability on product quality.	x	x			x	x								

6. Teaching and learning methods for disable students:

No.	Teaching Methods	Reason
1	Presentation of the course in digital material	Better access any time
2	communication with students	Better communication with certain cases
3	Asking small groups to do assignments; each composed of low ,medium and high performance students	Knowledge and skills transfer among different levels of students

7. Student evaluation:

7.1 Student evaluation method:

No.	Evaluation Method	Competencies	LO's
1	Periodic exams	A4	a1,b1
2	Semester work	A4,A6	c4,c2
3	Final term examination	A4/A6	a1/b1

7.2 Evaluation Schedule:

No.	Evaluation Method	Weeks
1	Periodic exams	8th
2	Student load	2nd -7th - 9th -14th
3	Final term examination	15th

7.3 weighting of Evaluation:

No.	Evaluation Method	Marks

1	Periodic exams	30
2	Student load	20
4	Final term examination	50
Total		**100**

8. List of References:

No.	Reference List
1	Quality assurance and quality control in the analytical chemical laboratory : a practicalapproach,Konieczka, Piotr;Namieśnik, JacekCRC Press, 2018

9. Facilities required for teaching and learning:

No.	Facility	No.	Facility
1	Lecture classroom	4	Data show system
2	Presenter	5	Wireless internet
3	White board	6	Sound system

10. Matrix of Competencies and LO's of the course:

No.	Topic	Aims	Competencies	LO's
1	The meaning of standardization and its methods	2,4	A4	a1, a2
2	Define of STM, CAS, ISO, GMP, quality control and quality assurance.	2,4	A4	a1, a2
3	Gases applications according to standard	6	A4	c4, c2
4	Liquids applications according to standard	6	A4	c4 , c2
5	Materials applications according to standard	6	A4	c4, c2
6	Tools , pipe lines and their applications according to standard	4	A4	b1
7	Instruments and reactors and their applications according to standard	4	A4	b1
8	Methods of quality control	4,6	A6	b1,c2
9	Reliability on product quality.	4,6	A6	b1,c2

Course Coordinator: Dr. yasser twik

Head of Department: Ass. Prof. Dr. Khaled Samir

Date of Approval: 2023

Project 2
CHE424

1-Basic Information:

Program Title	Chemical Engineering Program
Department Offering the Program	Chemical Engineering Department
Department Responsible for the Course	Chemical EngineeringDepartment
Course Title	Project 2
Course Code	CHE424
Year/Level	Level4
Specialization	Major
Authorization Date of Course Specification	-

Teaching hours	**Lectures**	**Exercise**	**laboratory**	**Student's load**
	2	-	4	4

2-Course Aims:

No.	**Aims**
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.
10	Apply research findings in chemical reactions to exhibit their properties in order to assess the results and draw conclusions about industrial operations.

3-Competencies:

Competencies	**Learning Outcomes (LO'S)**
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 Effectively manage tasks, time, and resources. d3 Refer to relevant literatures.
B3. Apply numerical modeling methods and/or computational techniques appropriate to chemical engineering.	d1 Apply numerical modeling methods and/or computational techniques appropriate to project of chemical engineering.
B4. Adopt suitable national and international standards and codes to: design, operate, inspect and maintain chemical engineering systems.	d1Adopt suitable national and international standards and codes to: design, operate chemical engineering systems related to the project.

4. Course Contents:

	Topics	Lecture	Exercise	laboratory	Student load
1	Investigations on the chemical industrial problems of Project I by written reports and team presentations.	28	-	56	56
Total		**28**	**-**	**56**	**56**

5. Teaching and learning methods:

No	Topics	Face-to-Face Lecture	Online Lecture	Flipped Classroom	Presentation and movies	Discussion	Problem solving	Brain storming	Projects	Site visits	Self-learning and Research	Cooperative	Discovering	Modeling	lab

1	Investigations on the chemical industrial problems of Project I by written reports and team presentations.	**x**			**x**				**x**	**x**	**x**	**x**		**x**	**x**

6. Teaching and learning methods for disable students:

No.	Teaching Methods	Reason
1	Presentation of the course in digital material	Better access any time
2	Web communication with students	Better communication with certain cases
3	Asking small groups to do assignments; each composed of low ,medium and high performance students	Knowledge and skills transfer among different levels of students

7. Student evaluation:

7.1 Student Evaluation Method:

No.	Evaluation Method	Competencies	LO's
1	Oral Examination	A7,A8,A9,B3,B4	d1,d2,d3
2	Semester work	A7,A8,A9,B3,B4	d1,d2,d3
3	Report evaluation	A7,A8,A9,B3,B4	d1,d2,d3

7.2 Evaluation Schedule:

No.	Evaluation Method	Weeks
1	Oral Examination	at the end of IE 510
2	Student load	2^{nd} -7^{th} - 9^{th}- 14^{th}
3	Report evaluation	After final exam by 2 weeks

7.3 weighting of Evaluation:

No.	Evaluation method	Marks
1	Oral Examination	50
2	Student load	25
3	Report evaluation	75
Total		**150**

8. List of References:

No.	Reference List
1	Subject studies

9. Facilities required for teaching and learning:

No.	Facility	No.	Facility
1	Lecture classroom	4	Data show system
2	Presenter	5	Sound system
3	White board		

10. Matrix of Competencies and LO's of the course:

No.	Topic	Aims	Competencies	LO's
1	Investigations on the chemical industrial problems of Project I by written reports and team presentations.	7,8,10	A7,A8,A9,B3,B4	d1,d2,d3

Course Coordinator: Asso.prof. Hend Elsayed Gadow

Head of Department: Asso.prof. Hend Elsayed Gadow

Date of Approval: 2023

Industrial Safety
CHE425A

1-Basic Information:

Program Title	Chemical Engineering Program
Department Offering the Program	Chemical Engineering Department
Department Responsible for the Course	Chemical Engineering Department
Course Title	Industrial Safety
Course Code	CHE425A
Year/Level	Level4
Specialization	Major
Authorization Date of Course Specification	-

Teaching hours	**Lectures**	**Exercise**	**laboratory**	**Student's load**
	2	2	-	3

2-Course Aims:

No.	Aims
6	Analyze data from the intended tests to manage resources creatively.
8	Consider the impact of industrial safety on society, economics, and the environment using fundamental knowledge of chemical process industries.

3- Competencies:

Competencies	**Learning Outcomes (LO'S)**
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.	**a2** Understand the professional ethics and impacts of engineering solutions on society and environment **c1** Incorporate economic, societal, global, environmental, and risk management factors into design.

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** Professionally merge the engineering knowledge, understanding, and feedback to improve design, products and/or services related to industrial Safety.

4. Course Contents:

No.	Topics	Lecture	Exercise	laboratory	Student load
1	Introduction in safety	4	4	-	6
2	Preventing emergencies in the process of industry	4	4	-	6
3	Human error	4	4	-	6
4	Identification and assessment of hazards, Fires and explosions	6	6	-	9
5	Case studies of hazard of plant	6	6	-	9
6	Miscellaneous topics to be covered by invited Lecturers	4	4	-	6
Total		**28**	**28**	-	**42**

5. Teaching and learning methods:

No	Topics	Face-to-Face Lecture	Online Lecture	Flipped Classroom	Presentation and movies	Discussion	Problem solving	Brain storming	Projects	Site visits	Self-learning and Research	Cooperative	Discovering	Modeling	lab
1	Introduction in safety	x	x			x					x				
2	Preventing emergencies in the process of industry	x	x	x		x					x				
3	Human error	x	x			x					x				

4	Identification and assessment of hazards, Fires and explosions	x	x	x		x					x				
5	Case studies of hazard of plant	x	x	x		x					x				
6	Miscellaneous topics to be covered by invited Lecturers	x	x	x		x					x				

6. Teaching and learning methods for disable students:

No.	Teaching Methods	Reason
1	Presentation of the course in digital material	Better access any time
2	Web communication with students	Better communication with certain cases
3	Asking small groups to do assignments; each composed of low ,medium and high performance students	Knowledge and skills transfer among different levels of students

7. Student evaluation:

7.1 Student evaluation method:

No.	Evaluation Method	Competencies	LO's
1	Periodic exams	A3	a2,c1
2	Semester work (sheets, quizzes, presentation)	A10	d1,d2
3	Final term examination	A3/A10	a2,c1/d1,d2

7.2 Evaluation Schedule:

No.	Evaluation Method	Weeks
1	Periodic exams	8_{th}
2	Student load	2_{nd} -7_{th} - 9_{th}-14_{th}
3	Final term examination	15^{th}

7.3 weighting of Evaluation:

No.	Evaluation method	Marks
1	Periodic exams	30
2	Student load	20
3	Final term examination	50
Total		**100**

8. List of References:

No.	Reference List
1	J Maiti Pradip Kumar Ray, Industrial Safety Management, Springer Singapore,2018. DOI 10.1007/978-981-10-6328-2
2	S. Z. Mansdorf, Handbook of Occupational Safety and Health,third edition, John Wiley & Sons. Copyright., 2019

9. Facilities required for teaching and learning:

No.	Facility	No.	Facility
1	Lecture classroom	4	Data show system
2	Presenter	5	Sound system
3	White board		

10. Matrix of Competencies and LO's of the course:

No.	Topic	Aims	**Competencies**	**LO's**
1	Introduction in safety	8	A3	a2,c1
2	preventing emergencies in the process industry	6,8	A10	d1,d2
3	Human error	8	A3	c1,a2
4	Identification and assessment of hazards, Fires and explosions	6,8	A3	c1,a2
5	Hazard of plant modification and case studies	8	A10	d1,d2
6	miscellaneous topics to be covered by invited lecturers	6,8	A10	d1,d2

Course Coordinator: Dr Mohamed fakih

Head of Department: Asso.prof. Hend Elsayed Gadow

Date of Approval: 2023

Selected Topics in Chemical Engineering
CHE425B

1-Basic Information:

Program Title	Chemical Engineering Program
Department Offering the Program	Chemical Engineering Department
Department Responsible for the Course	Chemical Engineering Department
Course Title	Selected Topics in Chemical Engineering
Course Code	CHE425B
Year/Level	Level 4
Specialization	Major
Authorization Date of Course Specification	-

Teaching hours	Lectures	Exercise	laboratory	Student's load
	2	2	-	3

2-Course Aims:

No.	Aims
6	Analyze data from the intended tests to manage resources creatively.
8	Consider the impact of different industries on society, economics, and the environment using fundamental knowledge of chemical process industries.

3- Competencies:

Competencies	Learning Outcomes (LO'S)
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.	**a2** Understand the professional ethics and impacts of engineering solutions on society and environment **c1** Incorporate economic, societal, global, environmental, and risk management factors into design.

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** Professionally merge the engineering knowledge, understanding, and feedback to improve design, products and/or services related to selected topics.

4. Course Contents:

No.	Topics	Lecture	Exercise	laboratory	Student load
1	Special topics to be selected by the department to address new subjects in Chemical Engineering.	28	28	-	42
Total		**28**	**28**	**-**	**42**

5. Teaching and learning methods:

No	Topics	Face-to-Face Lecture	Online Lecture	Flipped Classroom	Presentation and movies	Discussion	Problem solving	Brain storming	Projects	Site visits	Self-learning and Research	Cooperative	Discovering	Modeling	lab
1	Special topics to be selected by the department to address new subjects in Chemical Engineering.	x	x	x	x	x	x				x				

6. Teaching and learning methods for disable students:

No.	Teaching Methods	Reason
1	Presentation of the course in digital material	Better access any time
2	Web communication with students	Better communication with certain cases

3	Asking small groups to do assignments; each composed of low ,medium and high performance students	Knowledge and skills transfer among different levels of students

7. Student evaluation:

7.1 Student Evaluation Method:

No.	Evaluation Method	Competencies	LO's
1	Periodic exams	A3	a2,c1
2	Semester work (sheets, quizzes, presentation)	A10	d1,d2
3	Final term examination	A3/A10	a2,c1/d1,d2

7.2 Evaluation Schedule:

No.	Evaluation Method	Weeks
1	Periodic exams	8th
2	Student load	2nd -7th - 9th -14th
3	Final term examination	15th

7.3 weighting of Evaluation:

No.	Evaluation method	Marks
1	Periodic exams	30
2	Student load	20
3	Final term examination	50
Total		**100**

8. List of References:

No.	Reference List
1	Yasir Beeran Pottathara, Sabu Thomas, Nandakumar Kalarikkal, Yves Grohens, Vanja Kokol "Nanomaterials Synthesis Design, Fabrication and Applications" Elsevier; 1st edition, (2019).
2	Tahir Awan, Almas Bashir, Aqsa Tehseen "Chemistry of Nanomaterials Fundamentals and Applications" Elsevier; 1st edition, (2020).

9. Facilities required for teaching and learning:

No.	Facility	No.	Facility
1	Lecture classroom	4	Data show system
2	Presenter	5	Sound system
3	White board		

10. Matrix of Competencies and LO's of the course:

No.	Topic	Aims	Competencies	LO's
1	Special topics to be selected by the department to address new subjects in Chemical Engineering.	6,8	A3/A10	a2,c1/d1,d2

Course Coordinator: Dr. Yasser tawfik

Head of Department: Asso.prof. Hend Elsayed Gadow

Date of Approval: 2023

Plasticizers
CHE425C

1-Basic Information:

Program Title	Chemical Engineering Program
Department Offering the Program	Chemical Engineering Department
Department Responsible for the Course	Chemical Engineering Department
Course Title	Plasticizers
Course Code	CHE425C
Year/Level	Level 4
Specialization	Major
Authorization Date of Course Specification	

Teaching hours	**Lectures**	**Exercise**	**laboratory**	**Student's load**
	2	2	-	3

2-Course Aims:

No.	Aims
6	Analyze data from the intended tests to manage resources creatively.
8	Consider the impact of plasticizers industry on society, economics, and the environment using fundamental knowledge of chemical process industries.

3- Competencies:

Competencies	Learning Outcomes (LO'S)
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.	**a2** Understand the professional ethics and impacts of engineering solutions on society and environment **c1** Incorporate economic, societal, global, environmental, and risk management factors into design.

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** Professionally merge the engineering knowledge, understanding, and feedback to improve design, products and/or services related to plasticizers industry.

4. Course Contents:

	Topics	Lecture	Exercise	laboratory	Student load
1	Study for the properties of plasticizers	8	8	-	12
2	Importance and applications of plasticizers	10	10	-	15
3	Techniques of the addition of plasticizers to polymers	10	10	-	15
Total		**28**	**28**	**-**	**42**

5. Teaching and learning methods:

No	Topics	Face-to-Face Lecture	Online Lecture	Flipped Classroom	Presentation and movies	Discussion	Problem solving	Brain storming	Projects	Site visits	Self-learning and Research	Cooperative	Discovering	Modeling	lab
1	Study for the properties of plasticizers	x	x	x	x	x					x				
2	Importance and applications of plasticizers	x	x	x	x	x					x				

3	Techniques of the addition of plasticizers to polymers	**x**	**x**	**x**	**x**	**x**					**x**				

6. **Teaching and learning methods for disable students:**

No.	Teaching Methods	Reason
1	Presentation of the course in digital material	Better access any time
2	Web communication with students	Better communication with certain cases
3	Asking small groups to do assignments; each composed of low ,medium and high performance students	Knowledge and skills transfer among different levels of students

7. **Student evaluation:**

7.1 Student evaluation method:

No.	Evaluation Method	Competencies	LO's
1	Periodic exams	A3	a2,c1
2	Semester work (sheets, quizzes, presentation)	A10	d1,d2
3	Final term examination	A3/A10	a2,c1/d1,d2

7.2 Evaluation Schedule:

No.	Evaluation Method	Weeks
1	Periodic exams	Any week
2	Student load	Any week
3	Final term examination	15^{th}

7.3 weighting of Evaluation:

No.	Evaluation method	Marks
1	Periodic exams	30
2	Student load	20
3	Final term examination.	50
	Total	**100**

8. **List of References:**

No.	Reference List

1	George Wypych "Handbook of Plasticizers" ChemTec Publishing; 3rd Edition, (2017).
2	Introduction to Plastics Engineering. Anshuman Shrivastava. Elsevier. 2018. DOI: https://doi.org/10.1016/B978-0-323-39500-7.00001-0

9. Facilities required for teaching and learning:

No.	Facility	No.	Facility
1	Lecture classroom	4	Data show system
2	Presenter	5	Sound system
3	White board		

10. Matrix of Competencies and LO's of the course:

No.	Topic	Aims	Competencies	LO's
1	Study for the properties of plasticizers	6,8	A3	a2,c1
2	Importance and applications of plasticizers	6,8	A10	d1,d2
3	Techniques of the addition of plasticizers to polymers	6,8	A10	d1,d2

Course Coordinator: Asso.prof. Hend Elsayed Gadow

Head of Department: Asso.prof. Hend Elsayed Gadow

Date of Approval: 2023

Fertilizers Technology
CHE425D

1-Basic Information:

Program Title	Chemical Engineering Program
Department Offering the Program	Chemical Engineering Department
Department Responsible for the Course	Chemical Engineering Department
Course Title	Fertilizers Technology
Course Code	CHE425D
Year/Level	Level 4
Specialization	Major
Authorization Date of Course Specification	

Teaching hours	Lectures	Exercise	laboratory	Student's load
	2	2	-	3

2-Course Aims:

No.	Aims
6	Analyze data from the intended tests to manage resources creatively.
8	Consider the impact of fertilizers technology on society, economics, and the environment using fundamental knowledge of chemical process industries.

3- Competencies:

Competencies	Learning Outcomes (LO'S)
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.	**a2** Understand the professional ethics and impacts of engineering solutions on society and environment **c1** Incorporate economic, societal, global, environmental, and risk management factors into design.

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** Professionally merge the engineering knowledge, understanding, and feedback to improve design, products and/or services related to fertilizers technology.

4. Course Contents:

	Topics	Lecture	Exercise	laboratory	Student load
1	History of chemical fertilizers- Importance and uses of fertilizers	4	4	-	4
2	Potassium fertilizers; production and uses	4	4	-	4
3	phosphorus fertilizers; production and uses	4	4	-	4
4	Sulfur fertilizers- Calcium and Magnesium fertilizers.	4	4		6
5	Nitrogen fertilizers; production and uses	4	4		8
6	slow release and controlled release fertilizers	4	4		8
7	Liquid fertilizers- Bio fertilizers- Nano fertilizers.	4	4		8
Total		**28**	**28**	**-**	**42**

5. Teaching and learning methods:

No	Topics	Face-to-Face Lecture	Online Lecture	Flipped Classroom	Presentation and movies	Discussion	Problem solving	Brain storming	Projects	Site visits	Self-learning and Research	Cooperative	Discovering	Modeling	lab
1	History of chemical fertilizers- Importance and uses of fertilizers	x	x	x	x	x					x				
2	Potassium fertilizers; production and uses	x	x	x	x	x					x				
3	phosphorus fertilizers; production and uses	x	x	x	x	x					x				
4	Sulfur fertilizers- Calcium and Magnesium fertilizers.	x	x	x	x	x					x				
5	Nitrogen fertilizers; production and uses	x	x	x	x	x					x				
6	slow release and controlled release fertilizers	x	x	x	x	x					x				
7	Liquid fertilizers- Bio fertilizers- Nano fertilizers.	x	x	x	x	x					x				

6. Teaching and learning methods for disable students:

No.	Teaching Methods	Reason
1	Presentation of the course in digital material	Better access any time
2	Web communication with students	Better communication with certain cases

3	Asking small groups to do assignments; each composed of low ,medium and high performance students	Knowledge and skills transfer among different levels of students

7. Student evaluation:

7.1 Student evaluation method:

No.	Evaluation Method	Competencies	LO's
1	Periodic exams	A3	a2,c1
2	Semester work(sheets, quizzes, presentation)	A10	d1,d2
3	Final term examination	A3,A10	a2,c1/d1,d2

7.2 Evaluation Schedule:

No.	Evaluation Method	Weeks
1	Periodic exams	Any week
2	Student load	Any week
3	Final term examination	15^{th}

7.3 weighting of Evaluation:

No.	Evaluation method	Marks
1	Periodic exams	30
2	Student load	20
3	Final term examination.	50
	Total	**100**

8. List of References:

No.	Reference List
1	Brahma Mishra "Fertilizer Technology And Management" Dreamtech Press, (2020).

9. Facilities required for teaching and learning:

No.	Facility	No.	Facility
1	Lecture classroom	4	Data show system
2	Presenter	5	Sound system
3	White board		

10. Matrix of Competencies and LO's of the course:

No.	Topic	Aims	Competencies	LO's

1	History of chemical fertilizers- Importance and uses of fertilizers	6,8	A3	a2,c1
2	Potassium fertilizers; production and uses	6,8	A10	d1,d2
3	phosphorus fertilizers; production and uses	6,8	A10	d1,d2
4	Sulfur fertilizers- Calcium and Magnesium fertilizers.	6,8	A3	a2,c1
5	Nitrogen fertilizers; production and uses	6,8	A10	d1,d2
6	slow release and controlled release fertilizers	6,8	A10	d1,d2
7	Liquid fertilizers- Bio fertilizers- Nano fertilizers.	6,8	A10	d1,d2

Course Coordinator: Asso.prof. Hend Elsayed Gadow

Head of Department: Asso.prof. Hend Elsayed Gadow

Date of Approval: 2023

Pulp and Paper Industry
CHE426A

1-Basic Information:

Program Title	Chemical Engineering Program
Department Offering the Program	Chemical Engineering Department
Department Responsible for the Course	Chemical Engineering Department
Course Title	Pulp and Paper Industry
Course Code	CHE426A
Year/Level	Level 4
Specialization	Major
Authorization Date of Course Specification	-

Teaching hours	Lectures	Exercise	laboratory	Student's load
	2	2	-	3

2-Course Aims:

No.	Aims
8	Consider the impact of pulp and Paper Industry on society, economics, and the environment using fundamental knowledge of chemical process related to paper industries.
9	Demonstrate current technical expertise related to pulp and paper Industry by addressing process dynamic and control challenges in plant operations.

3- Competencies:

Competencies	Learning Outcomes (LO'S)
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.	**a2** Understand the professional ethics and impacts of engineering solutions on society and environment **c1** Incorporate economic, societal, global, environmental, and risk management factors into design.

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** Professionally merge the engineering knowledge, understanding, and feedback to improve design, products and/or services related to paper Technology.
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 paper technology to respond to the challenging role and responsibilities of a professional chemical engineer
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 paper technology systems.

4. Course Contents:

	Topics	Lecture	Exercise	laboratory	Student load
1	Raw materials of papers	4	4	-	6
2	fabrication processes of paper	8	10	-	12
3	Emulsion types	4	2	-	6
4	pulp formation	4	4	-	6
5	evaporation processes	4	4	-	6
6	Drying process	4	4	-	6
Total		**28**	**28**	-	**42**

5. Teaching and learning methods:

No	Topics	Face-to-Face Lecture	Online Lecture	Flipped Classroom	Presentation and movies	Discussion	Problem solving	Brain storming	Projects	Site visits	Self-learning and Research	Cooperative	Discovering	Modeling	lab
1	Raw materials of papers	x	x	x	x	x					x				
2	fabrication processes of paper	x	x	x	x	x					x				
3	Emulsion types	x	x	x	x	x					x				
4	pulp formation	x	x	x	x	x					x				
5	evaporation processes	x	x	x	x	x					x				
6	Drying process	x	x	x	x	x					x				

6. Teaching and learning methods for disable students:

No.	Teaching Methods	Reason
1	Presentation of the course in digital material	Better access any time
2	Web communication with students	Better communication with certain cases
3	Asking small groups to do assignments; each composed of low ,medium and high performance students	Knowledge and skills transfer among different levels of students

7. Student evaluation:

7.1 Student evaluation method:

No.	Evaluation Method	Competencies	LO's
1	Periodic exams	A10,B4	d1,d2
2	Semester work(sheets, quizzes ,presentation)	A3,B2,B4	c1,d1,d1
3	Final term examination	A3	a2,c1

7.2 Evaluation Schedule:

No.	Evaluation Method	Weeks
1	Periodic exams	8th
2	Student load	2nd -7th - 9th -14th
3	Final term examination	15th

7.3 weighting of Evaluation:

No.	Evaluation method	Marks
1	Periodic exams	30
2	Student load	20
3	Final term examination	50
Total		**100**

8. List of References:

No.	Reference List
1	Timo Särkkä, Miquel Gutiérrez-Poch, Mark Kuhlberg "Technological Transformation in the Global Pulp and Paper Industry 1800–2018" Springer; 1st edition, (2018).
2	G. A. Smook, Gary A. Smook, Handbook for Pulp & Paper Technologists ,3rd Edition, Angus Wilde Publications, Inc., 2020.

9. Facilities required for teaching and learning:

No.	Facility	No.	Facility
1	Lecture classroom	4	Data show system
2	Presenter	5	Sound system
3	White board		

10. Matrix of Competencies and LO's of the course:

No.	Topic	Aims	Competencies	LO's
1	Raw materials of papers	8	A10	d1
2	fabrication processes of paper	9	A10	d2
3	Emulsion types	8,9	B4	d1
4	pulp formation	8,9	A3	a2,c1
5	evaporation processes	8,9	B2	d1
6	Drying process	8,9	B2	d1

Course Coordinator: Dr. / Riham Atef
Head of Department: Asso.prof. Hend Elsayed
Date of Approval: 2023

Polymer Processing
CHE426B

1-Basic Information:

Program Title	Chemical Engineering Program
Department Offering the Program	Chemical Engineering department
Department Responsible for the Course	Chemical Engineering department
Course Title	Polymer Processing
Course Code	CHE426B
Year/Level	Level 4
Specialization	Major
Authorization Date of Course Specification	-

Teaching hours	Lectures	Exercise	laboratory	Student's load
	2	2	-	3

2-Course Aims:

No.	Aims
8	Consider the impact of printing on society, economics, and the environment using fundamental knowledge of chemical process related to paper industries.
9	Demonstrate current technical expertise related to polymer processing by addressing process dynamic and control challenges in plant operations.

3- Competencies:

Competencies	Learning Outcomes (LO'S)
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.	**a2** Understand the professional ethics and impacts of engineering solutions on society and environment **c1** Incorporate economic, societal, global, environmental, and risk management factors into design.
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** Professionally merge the engineering knowledge, understanding, and feedback to

	improve design, products and/or services related to polymer processing.
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 polymer processing to respond to the challenging role and responsibilities of a professional chemical engineer
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 polymer processing systems.

4- Course Contents:

No.	Topics	Lecture	Exercise	laboratory	Student load
1	Theory and practice of polymer processing	4	4	-	6
2	Non-Newtonian flow	4	4	-	6
3	Kinetics and structural development during solidification	4	4	-	6
4	Physical characterization of microstructure and macroscopic properties	4	4	-	6
5	Type of polymer processing (extrusion, injection-molding, fiber, film, and rubber processing)	8	8	-	12
6	Component manufacturing and recycling issues, compounding and blending	4	4	-	6
Total		**28**	**28**	-	**42**

5. Teaching and learning methods:

No	Topics	Face-to-Face Lecture	Online Lecture	Flipped Classroom	Presentation and movies	Discussion	Problem solving	Brain storming	Projects	Site visits	Self-learning and Research	Cooperative	Discovering	Modeling	lab
1	Theory and practice of polymer processing	x	x			x									
2	Non-Newtonian flow	x	x			x					x				
3	Kinetics and structural development during solidification	x	x	x											
4	Physical characterization of microstructure and macroscopic properties	x	x			x									
5	Type of polymer processing (extrusion, injectionmolding, fiber, film, and rubber processing)	x	x	x		x									
6	Component manufacturing and recycling issues, compounding and blending	x	x			x									

6. Teaching and learning methods for disable students:

No.	Teaching Methods	Reason
1	Presentation of the course in digital material	Better access any time

2	Web communication with students	Better communication with certain cases
3	Asking small groups to do assignments; each composed of low ,medium and high performance students	Knowledge and skills transfer among different levels of students

7. Student evaluation:

7.1 Student Evaluation Method:

No.	Evaluation Method	Competencies	LO's
1	Periodic exams	A3/B2	a2,c1/d1
2	Semester work (sheets, quizs, presentation)	A3/B4/A10	a2,c1/d1/d1,d2
3	Final term examination	A3/B2/B4	a2,c1,/d1/d1

7.2 Evaluation Schedule:

No.	Evaluation Method	Weeks
1	Periodic exams	8_{th}
2	Student load	2_{nd} -7_{th} - 9_{th} -14_{th}
3	Final term examination	15^{th}

7.3 weighting of Evaluation:

No.	Evaluation method	Marks
1	Periodic exams	30
2	Student load	20
3	Final term examination	50
Total		**100**

8. List of References:

No.	Reference List
1	Klemens Kohlgrüber, Michael Bierdel, Harald Rust "Plastics Compounding and Polymer Processing" Hanser Publications, (2021).
2	Anil Kumar, Rakesh K. Gupta " Fundamentals of Polymer Engineering" 3rd CRC Press, (2019).
3	Jean-François Agassant, Pierre Avenas, Pierre J. Carreau, Bruno Vergnes, Michel Vincent " Polymer processing Principles and modeling " 2nd Carl Hanser Verlag, Munich 2017.

9. Facilities required for teaching and learning:

No.	Facility	No.	Facility
1	Lecture classroom	4	Data show system
2	Presenter	5	Sound system

3	White board

10. Matrix of Competencies and LO's of the course:

No.	Topic	Aims	Competencies	LO's
1	Theory and practice of polymer processing	8	A3/A10	a2,c1, d1,d2
2	Non-Newtonian flow	9	A3	a2,c1
3	Kinetics and structural development during solidification	8,9	B2	d1
4	Physical characterization of microstructure and macroscopic properties	8,9	B4	a2,c1
5	Type of polymer processing (extrusion, injection-molding, fiber, film, and rubber processing)	8	B4,B2	d1,d1
6	Component manufacturing and recycling issues, compounding and blending	9	A3	c1,a2

Course Coordinator: Dr. / Yasser Tawfiq

Head of Department: Asso.prof. Hend Elsayed Gadow

Date of Approval: 2023

Refractories
CHE426C

1-Basic Information:

Program Title	Chemical Engineering Program
Department Offering the Program	Chemical Engineering Department
Department Responsible for the Course	Chemical Engineering Department
Course Title	Refractories
Course Code	CHE426C
Year/Level	Level 4
Specialization	Major
Authorization Date of Course Specification	-

Teaching hours	Lectures	Exercise	laboratory	Student's load
	2	2	-	3

2-Course Aims:

No.	Aims
8	Consider the impact of printing on society, economics, and the environment using fundamental knowledge of chemical process related to refractories.
9	Demonstrate current technical expertise related to refractories by addressing process dynamic and control challenges in plant operations.

3- Competencies:

Competencies	Learning Outcomes (LO'S)
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.	**a2** Understand the professional ethics and impacts of engineering solutions on society and environment **c1** Incorporate economic, societal, global, environmental, and risk management factors into design.

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** Professionally merge the engineering knowledge, understanding, and feedback to improve design, products and/or services related to refractories..
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 refractories.to respond to the challenging role and responsibilities of a professional chemical engineer
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 refractories systems.

4. Course Contents:

	Topics	Lecture	Exercise	laboratory	Student load
1	Glazes	2	2	-	3
2	Drying and firing	4	4	-	6
3	Hot forming and melt forming	4	4	-	6
4	Stone ware	4	4	-	6
5	Porcelain and gypsum	4	4	-	6
6	Enameling abrasives	4	4	-	6
7	Cement	4	4	-	6
8	Properties of refractories and Equilibrium diagrams.	2	2	-	3
Total		**28**	**28**	**-**	**42**

5. Teaching and learning methods:

No	Topics	Face-to-Face Lecture	Online Lecture	Flipped Classroom	Presentation and movies	Discussion	Problem solving	Brain storming	Projects	Site visits	Self-learning and Research	Cooperative	Discovering	Modeling	lab
1	Glazes	x	x			x									
2	Drying and firing	x	x			x	x				x				
3	Hot forming and melt	x	x	x		x									
	forming														
4	Stone ware	x	x								x				
5	Porcelain and gypsum	x	x	x		x									
6	Enameling abrasives	x	x			x									
7	Cement	x	x			x					x				
8	Properties of refractories and Equilibrium diagrams.	x	x	x		x					x				

6. **Teaching and learning methods for disable students:**

No.	Teaching Methods	Reason
1	Presentation of the course in digital material	Better access any time
2	Web communication with students	Better communication with certain cases
3	Asking small groups to do assignments; each composed of low ,medium and high performance students	Knowledge and skills transfer among different levels of students

7. **Student evaluation:**

7.1 Student evaluation method:

No.	Evaluation Method	Competencies	LO’s
1	Periodic exams	A10,A3	d1,d2/a2,c1
2	Semester work(sheets, quizzes, presentation)	B4,B2	d1,d1
3	Final term examination	B4,B2	d1,d1

7.2 Evaluation Schedule:

No.	Evaluation Method	Weeks
1	Periodic exams	8th
2	Student load	2nd -7th - 9th -14th
3	Final term examination	15th

7.3 weighting of Evaluation:

No.	Evaluation method	Marks
1	Periodic exams	30
2	Student load	20
3	Final term examination	50
Total		**100**

8. List of References:

No.	Reference List
1	Ritwik Sarkar, "Refractory Technology Fundamentals and Applications" 1st edition, CRC Press, 2017.
2	Sengupta, Prasunjit, "Refractories for the Cement Industry" Springer International Publishing, 2019.

9. Facilities required for teaching and learning:

No.	Facility	No.	Facility
1	Lecture classroom	4	Data show system
2	Presenter	5	Sound system
3	White board		

10. Matrix of Competencies and LO's of the course:

No.	Topic	Aims	Competencies	LO's
1	Glazes	8	A3	a2,c1
2	Drying and firing	9	B4	d1
3	Hot forming and melt forming	9	B4	d1
4	Stone ware	8	B2	d1
5	Porcelain and gypsum	8	A10	d1d2,
6	Enameling abrasives	8	A10	d1,
7	Cement	9	B2	d1,d2

8	Properties of refractories and Equilibrium diagrams.	9	A3	a2,c1

Course Coordinator: Dr. Yasser tawfik

Head of Department: Asso.prof. Hend Elsayed Gadow

Date of Approval: 2023

Printing Technology

CHE426D

1-Basic Information:

Program Title	Chemical Engineering Program
Department Offering the Program	Chemical Engineering Department
Department Responsible for the Course	Chemical Engineering Department
Course Title	Printing Technology
Course Code	CHE426D
Year/Level	Level 4
Specialization	Major
Authorization Date of Course Specification	-

Teaching hours	**Lectures**	**Exercise**	**laboratory**	**Student's load**
	2	2	-	3

2-Course Aims:

No.	Aims
8	Consider the impact of printing on society, economics, and the environment using fundamental knowledge of chemical process related to printing technology.
9	Demonstrate current technical expertise related toprinting technology by addressing process dynamic and control challenges in plant operations.

3- Competencies:

Competencies	Learning Outcomes (LO'S)
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.	**a2** Understand the professional ethics and impacts of engineering solutions on society and environment **c1** Incorporate economic, societal, global, environmental, and risk management factors into design.

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** Professionally merge the engineering knowledge, understanding, and feedback to improve design, products and/or services related to printing.
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 printing to respond to the challenging role and responsibilities of a professional chemical engineer
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 printing systems.

4-Course Contents:

	Topics	Lecture	Exercise	laboratory	Student load
1	Printing inks, its types, and classification of it.	4	4	-	6
2	Printing on different materials, conditions of printing, and constrains on printing process.	6	6	-	9
3	Printing on textile, preparation and finishing	6	6	-	9
4	Printing on paper, preparation and finishing	4	4	-	6
5	Printing on plastics, preparation and finishing	4	4	-	6
6	Stability effect of different factors on printing quality	4	4	-	6
Total		**28**	**28**	**-**	**42**

5. Teaching and learning methods:

No	Topics	Face-to-Face Lecture	Online Lecture	Flipped Classroom	Presentation and movies	Discussion	Problem solving	Brain storming	Projects	Site visits	Self-learning and Research	Cooperative	Discovering	Modeling	lab
1	Printing inks, its types, and classification of it.	x	x	x		x					x				
2	Printing on different materials, conditions of printing, and constrains on printing process.	x	x	x		x					x				
3	Printing on textile, preparation and finishing	x	x	x		x					x				
4	Printing on paper, preparation and finishing	x	x	x		x					x				
5	Printing on plastics, preparation and finishing	x	x	x		x					x				
6	Stability effect of different factors on printing quality	x	x	x		x					x				

6. Teaching and learning methods for disable students:

No.	Teaching Methods	Reason
1	Presentation of the course in digital material	Better access any time

2	Web communication with students	Better communication with certain cases
3	Asking small groups to do assignments; each composed of low ,medium and high performance students	Knowledge and skills transfer among different levels of students

7. Student evaluation:

7.1 Student evaluation method:

No.	Evaluation Method	Competencies	LO's
1	Periodic exams	A10,A3,B2	a2,c1,d1
2	Semester work(sheets, quizzes ,presentation)	A10,A3,B2,B4	c1,d1,d2
3	Final term examination	A10,A3	a2,d2

7.2 Evaluation Schedule:

No.	Evaluation Method	Weeks
1	Periodic exams	8th
2	Student load	2nd -7th - 9th-14th
3	Final term examination	15th

7.3 weighting of Evaluation:

No.	Evaluation method	Marks
1	Periodic exams	30
2	Student load	20
3	Final term examination	50
Total		**100**

8. List of References:

No.	Reference List
1	NIIR Board, "The Complete Book on Printing Technology" national institute of industrial research (2017).
2	NIIR Board of Consultants & Engineers, "The Complete Book on Printing Technology with Process Flow Diagrams" Asia Pacific Business Press Inc, 2019.

9. Facilities required for teaching and learning:

No.	Facility	No.	Facility
1	Lecture classroom	4	Data show system
2	Presenter	5	Sound system

3	White board

10. Matrix of Competencies and LO's of the course:

No.	Topic	Aims	Competencies	LO's
1	Printing inks, its types, and classification of it.	8,9	A10	d1
2	Printing on different materials, conditions of printing, and constrains on printing process.	8,9	A10	d2
3	Printing on textile, preparation and finishing	8,9	A3,B2	a2,c1,d1
4	Printing on paper, preparation and finishing	8,9	A3,B2	a2,c1,d1
5	Printing on plastics, preparation and finishing	8,9	A3,B2	a2,c1,d1
6	Stability effect of different factors on printing quality	8,9	B4	d1

Course Coordinator: Asso.prof. Hend Elsayed Gadow

Head of Department: Asso.prof. Hend Elsayed Gadow

Date of Approval: 2023