College of Engineering
Academic Accreditation Committee

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UNIVERSITY OF ANBAR
COLLEGE OF ENGINEERING

College of
Engineering

COURSE SYLLABUS

Renewable Energy

Course Code: ME 4302E

2nd Semester, 2021 / 2022

COURSE SYLLABUS

Course Title	**Renewable Energy**		
Course Code	**ME 4302E**		
Credit Hours	2		
Pre-requisite(s)	**ME 3307 - Heat Transfer-II**		
Co-requisite(s)	-		
Semester	2	**Year**	2021-2022
Instructors Name	Dr.Ahmed Ali Najeeb Alashaab		
Office Location	ME Building, Room No.2		
Tel. No.	009647825563296		
Email	ashaab_1977@uoanbar.edu.iq		
Lecture Times	10:30 – 11:30 Monday 10:30-12:30 Tuesday		
Office Hours	9:00AM-1:00PM Thursday , 8:30AM-11:30 Monday		

Course Definition

This is an elective course for Mechanical Engineering Program. The course will cover the basic principles of Renewable Energy.

Course Description (as in the catalogue):

Non-renewable& Renewable Energy Resources; Advantages of non-conventional energy sources; Disadvantages of non-conventional energy sources. The Physics of Solar Radiation; Sky Radiation; Principal Definitions; Calculation of Radiation Intercepted By Surface Beam Component South Facing Horizontal & Vertical Surface Fixed South Facing Titled Surface. Non-South Facing Titled Surface Total Beam, Diffuse and Reflected Solar Radiation on a

Surface Thermal solar collectors (Flat & Concentrating Collectors);Thermal Energy Losses from Solar Collector ;The amount of heat absorbed by the collector ;The amount of useful thermal energy gain from the collector ;Efficiency of Solar Collector. The Principal Working of PV Cell; Calculation the power of the domestic house devices; Calculation the losses power of Inverter &Converter; The number, cost and area of PV panels; The number & cost of Batteries; The cost of others equipment and accessories of PV System; The total cost of PV System for a single house. Wind Power Plant; The Principal Working of Wind Energy; Calculation Performance of wind turbine; Wind Turbine Classification; Geothermal energy; Electricity production; Flash Power Plant; Dry Steam Power Plant; Binary steam power plant; The Ground-Coupled Heat Pump (GCHS); Hydro power plant; General layout of a hydroelectric power plant; Efficiencies of hydroelectric power turbine ; Classification of hydraulic turbines .; Biomass energy; Biogas Energy; Tidal Energy; Energy Conservation, Energy Tax ;Building Design; Domestic Energy Consumption; Heat Transmission in Building Structures; Design Purpose for Building Space Heating under Iraqi Weather Conditions.

Course Learning Outcomes:

By the end of successful completion of this course, the student will be able to:

1. Describe the environmental aspects of non-conventional energy resources. In Comparison with various conventional energy systems, their prospects and limitations.
2. Provide a solid foundation for developing the use of renewable energy systems and . Perform an initial design of a renewable energy system.
3. Know the need of renewable energy resources, historical and latest developments and Compare Solar, Wind and bio energy systems, their prospects, Advantages and limitations.
4. Acquire the knowledge of fuel cells, wave power, tidal power and geothermal principles and applications.

Alignment of Course Student Learning Outcomes to Program Student Learning Outcomes

CLOs		SOs (ABET) / NGOs (INAC)						
		1/i	2/ii	6/iii	3/iv	4/v	7/vi	5/vii
1. Describe the environmental aspects of non-conventional energy resources. In Comparison with various conventional energy systems, their prospects and limitations.	Link	4	4					
	Assess	Q, E,H	Q, E,H					
2. Provide a solid foundation for developing the use of renewable energy systems and . Perform an initial design of a renewable energy system.	Link	4	4					
	Assess	Q, E	Q, E					
3. Know the need of renewable energy resources, historical and latest developments and Compare Solar, Wind and bio energy systems, their prospects, Advantages and limitations.	Link	3	3					
	Assess	Q	Q					
4. Acquire the knowledge of fuel cells, wave power, tidal power and geothermal principles and applications.	Link	3	3					
	Assess	Q	Q					

Assessment Key- **E:** Exam, **H:** Homework, **Q:** Quiz, **P:** Project, **DP:** Design Project, **R:** Research, **T**: Teamwork, **PT**: Practical Training, **FW:** Field Work, **PR:** Presentation, **RE:** Report, **S:** Survey, **SE:** Seminar, **W:** Workshop, **C:** Conference, **O:** Other

Weekly Distribution of Course Topics/Contents

Week	Topic	Comments*	Course CLO
1.	Describe the environmental aspects of non-conventional energy resources. In Comparison with various conventional energy systems, their prospects and limitations.		**1,2,**
2.	Describe the environmental aspects of non-conventional energy resources. In Comparison with various conventional energy systems, their prospects and limitations.		**1,2,**
3.	Describe the environmental aspects of non-conventional energy resources. In Comparison with various conventional energy systems, their prospects and limitations.		**1,2,3**
4.	Describe the environmental aspects of non-conventional energy resources. In Comparison with various conventional energy systems, their prospects and limitations.		**1,2,3**
5.	Provide a solid foundation for developing the use of renewable energy systems		**1,2,3**
6.	Provide a solid foundation for developing the use of renewable energy systems		**1,2,3**
7.	Provide a solid foundation for developing the use of renewable energy systems		**1,2**
8.	Perform an initial design of a renewable energy system.		**1,2**
9.	Perform an initial design of a renewable energy system.		**1,2,4**
10.	Know the need of renewable energy resources, historical and latest developments.		**1,2**
11.	Compare Solar, Wind and bio energy systems, their prospects, Advantages and limitations.		**1,2,4**
12.	Compare Solar, Wind and bio energy systems, their prospects, Advantages and limitations.		**1,2**
13.	Acquire the knowledge of fuel cells, wave power, tidal power and geothermal principles and applications.		**1,2,4**
14.	Acquire the knowledge of fuel cells, wave power, tidal power and geothermal principles and applications.		**1,2,4**
15.	Acquire the knowledge of fuel cells, wave power, tidal power and geothermal principles and applications.		**1,2,4**

* In the comments, you can add the relevant chapter or notes, etc.

Scheduling of laboratory and other non-lecture sessions, including online sessions, as appropriate (if applicable)

Week	Topic	Comments
1.		
2.		

Information on out-of-class assignments with due dates for submission

Assignment/Activity	Due Date	Comments

Students' Assessment:

Students are assessed as follows:

Assessment Tool(s)**	Date	Weight (%)
Exams		20
Quizzes		10
Homework's		10
Lab		
Final Exam		**40**

** You can modify / add other tools relevant to the course.

Course Outcome Assessment Plan:

Course SLOs	Teaching/Learning Method(s)	Assessment Tool(s)	Performance Indicators
1	Describe the environmental aspects of non-conventional energy resources. In Comparison with various conventional energy systems, their prospects and limitations.	**Lectures and tutorials**	**Q, E**
2	. Provide a solid foundation for developing the use of renewable energy systems and . Perform an initial design of a renewable energy system.	**Lectures and tutorials**	**Q, E**
3	3. Know the need of renewable energy resources, historical and latest developments and Compare Solar, Wind and bio energy systems, their prospects, Advantages and limitations.	**Lectures and tutorials**	**Q**
4	Acquire the knowledge of fuel cells, wave power, tidal power and geothermal principles and applications.	**Lectures and tutorials**	**Q**

E: Exam, **H:** Homework, **Q:** Quiz, **P:** Project, **DP:** Design Project, **R:** Research, **T**: Teamwork, **PT**: Practical Training, **FW:** Field Work, **PR:** Presentation, **RE:** Report, **S:** Survey, **SE:** Seminar, **W:** Workshop, **C:** Conference, **O:** Other

Teaching and Learning Resources:
Text Book(s):

1. JOHN N DUFFIE" Solar Energy Thermal Process" John Wiley&Sons, 2013
2. SOTERIS A. KALOGIROU " Solar Energy Engineering Processes and Systems" Academic Press is an imprint of Elsevier, 2014
3. PETER J. LUNDE" Solar Thermal Engineering" John Wiley&Sons, 1980

Recommended Readings:

Other Resources:

Course supplements will be used to present extra information not covered in the textbook.

Attendance policy:

Attendance is compulsory. A student missing 3% of the total allocated course hours will receive 1st warning notice and a student missing 7% will receive 2nd warning notice. A student missing 10% will be forced to withdraw and considered failed for the current academic year (in accordance with the university regulations).

Plagiarism/Cheating:

Students are expected to do their own work. You are allowed to work on assignments in teams only if specified by the instructor. In other words, students are encouraged to communicate about general principles of the course, but all assigned homework must be done on an individual basis. The instructor is available to provide any assistance that you may need. Cheating is considered a serious offense by the university. You should be aware of the severe penalty for cheating.

Notes:

Daily homework will be due at the beginning of the next class after it is assigned unless otherwise noted in class. All homework assignments should be turned in before class begins. Work turned in late will be penalized in increments of 10% per day. Work will not be accepted beyond two days late without special coordination affected prior to the due date. Students in this course with disability requiring an accommodation should contact the professor as soon as possible or contact the head of the department.

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COURSE SYLLABUS

COURSE TITLE
STRENGTH OF MATERIAL II

Course Code

ME 2306

Second Semester, 2021 / 2022

COURSE SYLLABUS

Course Title	**Strength of materials II**		
Course Code	**ME 2306**		
Credit Hours	3 hours		
Pre-requisite(s)	ME 2302 **Strength of materials I**		
Co-requisite(s)	Non		
Semester	second	**Year**	2021-2022
Instructors Name	Mazin Yaseen Abood		
Office Location			
Tel. No.	07822322077		
Email	Mazin76eng@uoanbar.edu.iq		
Lecture Times	Monday 09:30-11:30 and Wednesday 10:30-11:30		
Office Hours	Sunday to Tuesday 8:30-2:00		

Course Description (as in the catalogue):

Strength of materials, also called mechanics of materials, is a subject which deals with the behavior of solid objects subject to stresses and strains. The study of strength of materials often refers to various methods of calculating the stresses and strains in structural members, such as beams, columns, and shafts. The methods employed to predict the response of a structure under loading and its susceptibility to various failure modes takes into account the properties of the materials; in addition the mechanical element's macroscopic properties (geometric properties).

Course Objectives

The goals of this course are to enable students to:

1. Calculate stresses in thin and thick cylinders.

2. Calculate the deflection of determinate and indeterminate beams.

3. Explain and compute the combined stresses in different loading types.

4. Explain the difference between brittle and ductile material in term of failure mode.

5. Compute the factor of safety of different loading types.

Course Learning Outcomes:

By the end of successful completion of this course, the student will be able to:

1. Understand the difference of stresses in thin and thick cylinders.

2. Recognize the difference between deflection of determinate and indeterminate beams..

3. Recognize the difference between the brittle and ductile material in term of failure mode.

4. Draw Mohr's stress circle and computing combine stress in different type of loading.

Alignment of Course Student Learning Outcomes to Program Student Learning Outcomes

CLOs		SOs (ABET) / NGOs (INAC)						
		i	ii	iii	iv	v	vi	vii
Understand the difference of stresses in thin and thick cylinders	Link	4		4				
	Assess	Q		RE				
Recognize the difference between deflection of determinate and indeterminate beams.	Link	4						
	Assess	E,Q						
Recognize the difference between the brittle and ductile material in term of failure mode	Link	4		4				
	Assess	E,Q		RE				
Draw Mohr's stress circle and computing combine stress in different type of loading	Link	4						
	Assess	E,Q						

Assessment Key- E: Exam, **H:** Homework, **Q:** Quiz, **P:** Project, **DP:** Design Project, **R:** Research, **T**: Teamwork, **PT**: Practical Training, **FW:** Field Work, **PR:** Presentation, **RE:** Report, **S:** Survey, **SE:** Seminar, **W:** Workshop, **C:** Conference, **O:** Other

Weekly Distribution of Course Topics/Contents

Week	Topic	Comments*	CLO
1.	Deflection of determinate beams	**Ch-1**	**2**
2.	Deflection of determinate beams	**Ch-1**	**2**
3.	Deflection of indeterminate beams	**Ch-2**	**2**
4.	Deflection of indeterminate beams	**Ch-2**	**2**

Week	Topic	Comments*	CLO
5.	Deflection of indeterminate beams	**Ch-2**	**2**
6.	Thin cylinders	**Ch-3**	**1**
7.	Thin cylinders	**Ch-3**	**1**
8.	Thick cylinders	**Ch-4**	**1**
9.	Thick cylinders	**Ch-4**	**1**
10.	Thick cylinders	**Ch-4**	**1**
11.	combined stress	**Ch-5**	**4**
12.	combined stress	**Ch-5**	**4**
13.	combined stress	**Ch-5**	**4**
14.	Theories of failure	**Ch-6**	**3**
15.	Theories of failure	**Ch-6**	**3**
16.	**Final Exam**		

* In the comments, you can add the relevant chapter or notes, etc.

Scheduling of laboratory and other non-lecture sessions, including online sessions, as appropriate (if applicable)

Week	Topic	Comments	CLO
1	Deflection of simple supported beam		**2**
2	Deflection of simple supported beam		**2**
3	Deflection of cantilever beam		**2**
4	Deflection of cantilever beam		**2**
5	Deflection of built in beams		**2**
6	Deflection of built in beams		**2**
7	creep test		**3**
8	creep test		**3**

Information on out-of-class assignments with due dates for submission

Assignment/Activity	Due Date	Comments

Students' Assessment:

Students are assessed as follows:

Assessment Tool(s)**	Date	Weight (%)
Exams		24
Quizzes		10
Homework's		6
Lab		10
Final Exam		50
Total		**100%**

** You can modify / add other tools relevant to the course.

Course Outcome Assessment Plan:

CLOs	Teaching/Learning Method(s)	Assessment Tool(s)	Threshold
Understand the difference of stresses in thin and thick cylinders.	Lectures, Tutorials, Lab	exams, Quizzes, Report	50% pass
Recognize the difference between deflection of determinate and indeterminate beams	Lectures, Tutorials	exams, Quizzes	50% pass
Recognize the difference between the brittle and ductile material in term of failure mode	Lectures, Tutorials, Lab	exams, Quizzes, Report	50% pass
Draw Mohr's stress circle and computing combine stress in different type of loading	Lectures, Tutorials	exams, Quizzes	50% pass

Teaching and Learning Resources:

Text Book(s):

1. R.C. Hibbeler, Mechanics of Materials, Prentice Hall, 7th ed., 2007
2. E.J. Hearn, strength of materials. Third edition.1997

Recommended Readings:

Other Resources:

Attendance policy:

Attendance is compulsory. A student missing 3% of the total allocated course hours will receive 1st warning notice and a student missing 7% will receive 2nd warning notice. A student missing 10% will be forced to withdraw and considered failed for the current academic year (in accordance with the university regulations).

Plagiarism/Cheating:

Students are expected to do their own work. You are allowed to work on assignments in teams only if specified by the instructor. In other words, students are encouraged to communicate about general principles of the course, but all assigned homework must be done on an individual basis. The instructor is available to provide any assistance that you may need. Cheating is considered a serious offense by the university. You should be aware of the severe penalty for cheating.

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College of Engineering

Mechanical Engineering Department

COURSE SYLLABUS

Course Title: Calculus II

Course Code: ME 1207

2nd Semester, 2021 / 2022

COURSE SYLLABUS

Course Title	**Calculus II**		
Course Code	**ME 1207**		
Credit Hours	**(3-3-1-0)**		
Pre-requisite(s)	**Calculus I, physics I**		
Co-requisite(s)	----------		
Semester	**2**	**Year**	**First**
Instructors Name	**Dr.Ahmed Ali Najeeb Alashaab**		
Office Location	**ME Building, Room No.2**		
Tel. No.	**009647825563296**		
Email	**ashaab_1977@uoanbar.edu.iq**		
Lecture Times	**Sunday 8:30 – 10:30(A), 10:30-12:30(B) , Tuesday 11:30 – 1:30(A), Thursday8:30 – 10:30(B)**		
Office Hours	**Wednesdays 8:30 – 1:30 , Thursday 10:30 – 1:30**		

Course Definition

Calculus is the mathematical study of continuous change, in the same way that geometry is the study of shape and algebra is the study of generalizations of arithmetic operations.

Course Description (as in the catalogue)

Transcendental functions. Techniques of integration. Improper integrals. Sequences and Infinite series. Parametric equations and polar coordinates.

Course Learning Outcomes:

1. Evaluation of integration problems using different forms including by parts, trigonometric, partial, and root functions.
2. Evaluate of the indefinite and improper integrals by using different integration techniques.
3. To determine arc length and surface area using integration techniques and for parametric equations.
4. Sketching the graphs of polar equations and solving related problems including area and arc length.

5. Identifying the properties of sequences and their limits. Perform standard operations with convergent power series, including the method of differentiating and integrating term by term.

Alignment of Course Student Learning Outcomes to Program Student Learning Outcomes

Course Learning Outcomes: After successfully completing this course, the students will be able to:	SOs (ABET) / NGOs (INAC)							
	Item	1/i	2/ii	6/iii	3/iv	4/v	7/vi	5/vii
1.Evaluation of integration problems using different forms including by parts, trigonometric, partial, and root functions.	Link	3						
	Assess	H, Q, E						
2. Evaluate of the indefinite and improper integrals by using different integration techniques.	Link	3						
	Assess	H, Q, E						
3. To determine arc length and surface area using integration techniques and for parametric equations.	Link	3						
	Assess	H, Q, E						
4. Sketching the graphs of polar equations and solving related problems including area and arc length.	Link	3						
	Assess	H, Q, E						
5. Identifying the properties of sequences and their limits. Perform standard operations with convergent power series, including the method of differentiating and integrating term by term.	Link	3						
	Assess	H, Q, E						

E: Exam, **H:** Homework, **Q:** Quiz, **P:** Project, **DP:** Design Project, **R:** Research, **T**: Teamwork, **PT**: Practical Training, **FW:** Field Work, **PR:** Presentation, **RE:** Report, **S:** Survey, **SE:** Seminar, **W:** Workshop, **C:** Conference, **O:** Other

Pre-Requisites
by Topic

CALCULUS I

Weekly Distribution of Course Topics/Contents

Week	Topic	Comments*	Course CLO
1	Integral		1,2
2	Integral		1,2
3	Integration Techniques -Integration by Parts.		2
4	Integration Techniques- Trigonometric Integrals.		2
5	Integration Techniques- Partial Fractions		2
6	**Exam**		
7	Applications of Integrals-Infinite Integral,Areas		1,2
8	Applications of Integrals- Arc Length, Surface area		1,2
9	Applications of Integrals- Volumes (Disk, Washer, Shell)		**3**,4
10	Polar Coordinates - Common Polar Coordinate Graphs		3,4
11	Polar Coordinates - Tangents with Polar Coordinates, Curves defined by parametric equations.		3,4
12	**Exam**		
13	Sequences and Series		5
14	Sequences and Series		5
15	**Final Exam**		

* In the comments, you can add the relevant chapter or notes, etc.

Scheduling of laboratory and other non-lecture sessions, including online sessions, as appropriate (if applicable)

Week	Topic	Comments

Information on out-of-class assignments with due dates for submission

Assignment/Activity	Due Date	Comments

Students' Assessment:

Students are assessed as follows:

Assessment Tool(s)**	Date	Weight (%)
Quizzes, Classroom interactions, Homework, Presentation	Week-15	10%
Project	Week-7	15%
Progressive exams	Week-14	15%
Final Exam	Week-16	60%
Total		**100%**

** You can modify / add other tools relevant to the course.

Course Outcome Assessment Plan:

#	Course SLOs	Teaching/Learning Method(s)	Assessment Tool(s)	Performance Indicators
1	1.Evaluation of integration problems using different forms including by parts, trigonometric, partial, and root functions.	Lectures and tutorials	H, Q, E	**50% pass**
2	2. Evaluate of the indefinite and improper integrals by using different integration techniques.	Lectures and tutorials	H, Q, E	**50% pass**
3	To determine arc length and surface area using integration techniques and for parametric equations.	Lectures and tutorials	H, Q, E	**50% pass**
4	Sketching the graphs of polar equations and solving related problems including area and arc length.	Lectures and tutorials	H, Q, E	**50% pass**
5	Identifying the properties of sequences and their limits. Perform standard operations with convergent power series, including the method of differentiating and integrating term by term.	Lectures and tutorials	H, Q, E	**50% pass**

Teaching and Learning Resources:

Text Book(s): Calculus, Early Transcendental By James Stewart, 8th Edition, 2016, Cengage Learning

Recommended Readings:

1 – Advanced Engineering Mathematics, Kreyszig

2 – Advanced Engineering Mathematics, Wyle

3 – Further Engineering Mathematics, Stroud.

Other Resources:

Estimated Content

Engineering Topics		0 Credit
Engineering Science	100%	3 Credit
Engineering Design		0 Credit

Attendance policy:

Attendance is compulsory. A student missing 3% of the total allocated course hours will receive 1st warning notice and a student missing 7% will receive final warning notice. A student missing 10% will be forced to withdraw and considered failed for this course and the current academic year (in accordance with the university regulations).

Plagiarism/Cheating:

Students are expected to do their own work. You are allowed to work on assignments in teams only if specified by the instructor. In other words, students are encouraged to communicate about general principles of the course, but all assigned homework must be done on an individual basis. The instructor is available to provide any assistance that you may need. Cheating is considered a serious offense by the university. You should be aware of the severe penalty for cheating.

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COURSE SYLLABUS

APPLIED PHYSICS II
ME 1302

2nd Semester, 2021 / 2022

COURSE SYLLABUS

Course Title	APPLIED PHYSICS II		
Course Code	ME 1302		
Credit Hours	(2-2-1-0)		
Pre-requisite(s)	Calculus I, Physics I		
Co-requisite(s)			
Semester	2	**Year**	2022
Instructors Name	Dr. sattar abed mutlag		
Office Location	Department of mechanical engineering .ME-01		
Tel. No.	07812818819		
Email	Satmutt1961@yahoo.com		
Lecture Times	Thursday 8:30 to 10:30 and Sunday 8:30 to 10:30		
Office Hours	Monday 8:30 to 11		

Course Description (as in the catalogue):

This is the second semester, calculus-based introductory physics course that follows ME 1203. It is a Continuation of the survey of principles of classical physics presented in ME 1203. Topics studied include Electrostatics, Electric charge and electric field, Coulomb's law, electric potentials, Capacitance and dielectric, currents, Resistance Ohm's law, Electromotive force, Direct current circuits, magnetism, Magnetic field and magnetic forces, Sources of magnetic field, Biot- Savart Law, and Ampere's law, induction, Faraday's Law, Maxwell's equations, electromagnetic radiation, wave motion, and physical and geometrical optics

Course Objectives/Goals (optional):

Program and Course Outcomes:

1. Explain the origin of electromagnetic phenomena in view of modern atomic theory.
2. Define and calculate the basic physical quantities of electrostatics for the case of simple static charge distribution; namely: Coulomb's force, electrostatic field, electric Flux, electrostatic potential, voltage, and capacitance.
3. Represent the electric and magnetic field graphically for various charge distributions.
4. Draw the equipotential lines of electric potential for various simple charge configurations.
5. Define and calculate the basic physical quantities of Magneto statics for the case of simple steady current distribution; namely magnetic force, magnetic field, and magnetic dipole moment.

Alignment of Course Student Learning Outcomes to Program Student Learning Outcomes

CLOs		SOs (ABET) / NGOs (INAC)						
		1/i	2/ii	6/iii	3/iv	4/v	7/vi	5/vii
1- Explain the origin of electromagnetic phenomena in view of modern atomic theory.	Link	5		5				
	Assess	E,H,Q		E,H,Q				
2- Define and calculate the basic physical quantities of electrostatics for the case of simple static charge distribution; namely: Coulomb's force, electrostatic field, electric Flux, electrostatic potential, voltage, and capacitance.	Link	5		5				
	Assess	E,H,Q		E,H,Q				
3- Represent the electric and magnetic field graphically for various charge distributions.	Link	5		5				
	Assess	E,H,Q		E,H,Q				
4. Draw the equipotential	Link	5		5				
	Assess	E,H,Q		E,H,Q				

CLOs		SOs (ABET) / NGOs (INAC)						
lines of electric potential for various simple charge configurations.								
5- Define and calculate the basic physical quantities of Magneto statics for the case of simple steady current distribution; namely magnetic force, magnetic field, and magnetic dipole moment.	Link	**5**		**5**				
	Assess	**E,H,Q**		**E,H,Q**				

Assessment Key- E: Exam, **H:** Homework, **Q:** Quiz, **P:** Project, **DP:** Design Project, **R:** Research, **T**: Teamwork, **PT**: Practical Training, **FW:** Field Work, **PR:** Presentation, **RE:** Report, **S:** Survey, **SE:** Seminar, **W:** Workshop, **C:** Conference, **O:** Other

Weekly Distribution of Course Topics/Contents

Week	Topic	Comments	Course SLO
1.	Electric charge; Coulomb's law; Superposition of forces; Electric field; Electric fields of simple geometric static charge configuration; Electric field lines; Electric field around conductors in e.s. equilibrium; Electric dipole field; dipole moment and torque on a dipole. Concept of field; Electric field flux and Gauss's law.		1
2.	Electrostatics: Electric charge; Coulomb's law; Superposition of forces; Electric field; Electric fields of simple geometric static charge configuration;		**1**
3.	Electric field lines; Electric field around conductors in e.s. equilibrium; Electric dipole field; dipole moment and torque on a dipole.		**1**
4.	Electric potential energy; Electric potential difference (Voltage);		**1,2**
5.	Concept of field; Electric field flux and Gauss's law. Equipotential lines; Energy stored in simple charge		**1,2**

Week	Topic	Comments	Course SLO
	configurations, Potential due Electric dipole.		
6.	Capacitors and their capacitance; Capacitors in series and in parallel; Energy stored in a capacitor		**2**
7.	Current; resistance and Voltage ; Ohm's law; Resistivity; Conductivity; Electromotive force(emf) ; Power ;Kirchhoff's laws; RC circuits		**2**
8.	Gauss's law in magnetism ; Lorentz's force law; Force on a current carrying wire; Force between current carrying wires;		**2,3**
9.	Torque on a current loop; Magnetic field; Magnetic field due to steady current; Magnetic dipoles; Ampere's law;		**3**
10.	Biot- Savart Law; magnetic flux; Magnetic materials: Dia-,Para-, and Ferro-magnetism. Induced emf; Faraday's law; Lenz's law; Energy stored in a magnetic field.		**4**
11.	Eddy currents; Inductors; Mutual and self-inductance; Energy stored in an inductor; Transformers.		**4**
12.	AC voltage and current; simple Ac circuits and applications		**2,4**
13.	Impedance and phases. LR, LC and LRC circuits		**3,4**
14.	Ampere's law and displacement current; Maxwell's equations; Electromagnetic waves		**5**
15.	Light and electromagnetic wave; Geometrical optics		**5**
16.	**Final Exam**		

* In the comments, you can add the relevant chapter or notes, etc.

Scheduling of laboratory and other non-lecture sessions, including online sessions, as appropriate (if applicable)

Week	Topic	Comments

Information on out-of-class assignments with due dates for submission

Assignment/Activity	Due Date	Comments

Students' Assessment:

Students are assessed as follows:

Assessment Tool(s)**	Date	Weight (%)
Semester activities. These include quizzes, classroom interactions	Week-15	10
Mid semester exam	Week-7	30
Practical sessions		
Final Exam	Week-16	60
Total		100

** You can modify / add other tools relevant to the course.

Course Outcome Assessment Plan:

Course SLOs	Teaching/Learning Method(s)	Assessment Tool(s)	Performance Indicators
1-Gain knowledge about SI and customary systems.	Lectures and tutorials	H, Q, E	50% pass
2-To understand the concepts of using Newton's three laws to solve problems.	Lectures and tutorials	H, Q, E	50% pass
3-Represent graphically the problem of motion of a physical system using free-body diagram technique.	Lectures and tutorials	H, Q, E	50% pass
4. Analyse some problems of harmonic and wave motion in a wide variety of physical applications.	Lectures and tutorials	H, Q, E	50% pass
5-Identify the basic quantities in various mechanical physics applications.	Lectures and tutorials	H, Q, E	50% pass

Teaching and Learning Resources:
By Topics
Text Book(s):

R.D. Knight, Physics for Scientists and Engineers, 2nd ed., Pearson 2008

Recommended Readings:

1. Raymond A. Serway and John W. Jewett " Physics for Scientists and Engineers with Modern Physics".
2. H A N S C . O , and J O H N T. M A R K E R T, "Physics for Engineers and Scientists" Third Edition

Other Resources:

Attendance policy:

Attendance is compulsory. A student missing 3% of the total allocated course hours will receive 1st warning notice and a student missing 7% will receive 2nd warning notice. A student missing 10% will be forced to withdraw and considered failed for the current academic year (in accordance with the university regulations).

Plagiarism/Cheating:

Students are expected to do their own work. You are allowed to work on assignments in teams only if specified by the instructor. In other words, students are encouraged to communicate about general principles of the course, but all assigned homework must be done on an individual basis. The instructor is available to provide any assistance that you may need. Cheating is considered a serious offense by the university. You should be aware of the severe penalty for cheating.

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COURSE SYLLABUS

COURSE TITLE
Finite Element Method
Course Code: ME 4303E

2st Semester, 2021 / 2022

COURSE SYLLABUS

Course Title	Finite Element Method		
Course Code	ME 4303E		
Credit Hours	2		
Pre-requisite(s)	ME 2306 - Strength of materials-II, ME 3307 - Heat Transfer-II, ME2305 - Fluid Mechanics-II		
Co-requisite(s)			
Semester	2	Year	2021/2022
Instructors Name	Hamad M. Hasan, PhD		
Office Location			
Tel. No.	07735943588		
Email	Hamad.m.hasan@uoanbar.edu.iq		
Lecture Times	10:30 AM-12:30 AM, S and T		
Office Hours	8:30 AM-10:00 AM and 12:30 PM-1:30 PM, S and T		

Course Description (as in the catalogue):

Introduce the basic fundamentals of the finite element methods. Beginning with simple one-dimensional problem, continuing to two- and three-dimensional elements, and ending with some applications in heat transfer, solid mechanics and fluid mechanics. Covers modeling, mathematical formulation, and computer implementation.

Course Objectives/Goals (optional):

The goals of this course are to enable students to:

1. The students should understand the mathematical and physical principles underlying the FEA.
2. To provide students with basic skills of FEA programming using Matlab.

3. The formulation of finite element methods for linear static analysis of solids and structures.

Course Learning Outcomes:

1. Understand the basic finite element formulation techniques.
2. Be able to derive equations in finite element methods for 1D and 2D problems.
3. Be able to formulate and solve basic problems in heat transfer, solid mechanics and fluid mechanics.
4. Be able to write computer program based on finite element methods.

Alignment of Course Student Learning Outcomes to Program Student Learning Outcomes

CLOs		SOs (ABET) / NGOs (INAC)						
		1/i	2/ii	6/iii	3/iv	4/v	7/vi	5/vii
Understand the basic finite element formulation techniques	Link	5	4					
	Assess	E,H,Q	E,H,Q					
Be able to derive equations in finite element methods for 1D and 2D problems	Link	5	4					
	Assess	E,H,Q	E,H,Q					
Be able to formulate and solve basic problems in heat transfer, solid mechanics and fluid mechanics	Link	4	2					
	Assess	E,H,Q	E,H,Q					
Be able to write computer program based on finite element methods	Link	4	2					
	Assess	E,H,Q	E,H,Q					

Assessment Key- E: Exam, **H:** Homework, **Q:** Quiz, **P:** Project, **DP:** Design Project, **R:** Research, **T**: Teamwork, **PT**: Practical Training, **FW:** Field Work, **PR:** Presentation, **RE:** Report, **S:** Survey, **SE:** Seminar, **W:** Workshop, **C:** Conference, **O:** Other

Weekly Distribution of Course Topics/Contents

Week	Topic	Comments*	CLO
1.	Introduction		**1**
2.	Bar Element		**1**
3.	Beam Element		**1**
4.	Linear static analysis		**1**
5.	Two-Dimensional Analysis		**1**
6.	Finite element for two-dimensional problems		**1**
7.	Development of Truss Equations		**1**
8.	Development of Frame and Grid Equations		**2**
9.	Development of the Plane Stress and Plane Strain Stiffness Equations		**2**
10.	Isoperimetric Formulation		**3**
11.	Numerical Quadrature, Three-Dimensional Stress Analysis		**3**
12.	Finite Element Modeling and Solution Techniques		**3**
13.	Plate Elements		**4**
14.	Solid Elements for 3-D Elements		**4**
15.	Thermal Analysis		**4**
16.	**Final Exam**		

* In the comments, you can add the relevant chapter or notes, etc.

Scheduling of laboratory and other non-lecture sessions, including online sessions, as appropriate (if applicable)

Week	Topic	Comments	CLO

Information on out-of-class assignments with due dates for submission

Assignment/Activity	Due Date	Comments
HW	Week 4	
HW	Week 7	
HW	Week 9	
HW	Week 12	
HW	Week 14	

Students' Assessment:

Students are assessed as follows:

Assessment Tool(s)**	Date	Weight (%)
Exams		24
Quizzes		10
Homework's + Attendance		6
Lab		0
Final Exam		60
Total		

** You can modify / add other tools relevant to the course.

Course Outcome Assessment Plan:

CLOs	Teaching/Learning Method(s)	Assessment Tool(s)	Threshold
Understand the basic finite element formulation techniques.	Lectures and tutorials	**E,H,Q**	50% pass
Be able to derive equations in finite element methods for 1D and 2D problems.	Lectures and tutorials	**E,H,Q**	50% pass
Be able to formulate and solve basic problems in heat transfer, solid mechanics and fluid mechanics	Lectures and tutorials	**E,H,Q**	50% pass
Be able to write computer program based on finite element methods	Lectures and tutorials	**E,H,Q**	50% pass

Teaching and Learning Resources:

Text Book(s):

Olek C Zienkiewicz, Robert L Taylor, J.Z. Zhu, *The Finite Element Method: Its Basis and Fundamentals*, Sixth Edition, Butterworth-Heinemann 2005

Recommended Readings:

Other Resources:

Attendance policy:

Attendance is compulsory. A student missing 3% of the total allocated course hours will receive 1st warning notice and a student missing 7% will receive 2nd warning notice. A student missing 10% will be forced to withdraw and considered failed for the current academic year (in accordance with the university regulations).

Plagiarism/Cheating:

Students are expected to do their own work. You are allowed to work on assignments in teams only if specified by the instructor. In other words, students are encouraged to communicate about general principles of the course, but all assigned homework must be done on an individual basis. The instructor is available to provide any assistance that you may need. Cheating is considered a serious offense by the university. You should be aware of the severe penalty for cheating.

Notes:

All lecture notes will be posted in the google classroom. Daily homework will be due at the beginning of the next class after it is assigned unless otherwise noted in class. All homework assignments should be turned in before class begins. Work will not be accepted beyond the due date. Written work must be done independently and must accurately represent the work of the student. All exams and quizzes are to be completed independently.

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COURSE SYLLABUS

COURSE TITLE

COMPUTERPROGRAMMING

Course Code
ME 2310

2nd Semester, 2021 / 2022

COURSE SYLLABUS

Course Title	Computer Programming		
Course Code	ME 2310		
Credit Hours	3		
Pre-requisite(s)	ME 1204 Computer Science		
Co-requisite(s)			
Semester	2nd	**Year**	2021/2022
Instructors Name	Dr. Mohammed Ghanem Jehad		
Office Location	ME 03		
Tel. No.	07903764954		
Email	mgjehad@uoanbar.edu.iq		
Lecture Times	Sunday 8:30 AM – 10:30 AM , Tuesday 12:30 PM – 2:30 PM		
Office Hours	Wednesday 10:30 AM – 12:30 PM		

Course Description (as in the catalogue):

This course gives an introduction to programming in FORTRAN language. Language elements, data types and declaration, Arithmetic expressions, Precision. Comments, Intrinsic (built-in) procedures (functions), Simple input and output. Derived data types, Arrays (including dynamically-allocated), Logical and comparison expressions. Control statements (conditionals, loops etc.). Program units (functions, subroutines, modules).Complicated input and output, interactive and to files. Formatting and File Handling .Mathematical libraries

Course Objectives/Goals (optional):

The goals of this course are to enable students to:

1. To solve problems through writing FORTRAN programs.
2. To be able to develop FORTRAN programs from specifications and document those program.
3. To understand the useful of control structures, data types, input and output process.
4. To know how to verify that the programs are running correctly.
5. To write FORTRAN programs for engineering applications.

Course Learning Outcomes:

By the end of successful completion of this course, the student will be able to:

1. Write simple program modules to implement single numerical methods and algorithms
2. Calculate solutions to mechanical engineering problems using standard numerical methods
3. Test program output for accuracy using hand calculations and debugging techniques
4. Analyze the applicability and accuracy of numerical solutions to diverse mechanical engineering problems
5. Synthesize multiple program modules into larger program packages
6. Detail numerical results into a readable format that answers specific mechanical engineering analysis and design questions

Alignment of Course Student Learning Outcomes to Program Student Learning Outcomes

CLOs		SOs (ABET) / NGOs (ICAEE)						
		1/i	2/ii	6/iii	3/iv	4/v	7/vi	5/vii
1- Ability to write simple program modules to implement single numerical methods and algorithms.	Link	3						
	Assess	Q,E, HW						
2- Ability to calculate solutions to mechanical engineering problems using standard numerical methods	Link						3	
	Assess						Q,E, HW	
3- Test program output for accuracy using hand calculations and debugging techniques applications.	Link	2					2	
	Assess	Q,E, HW					Q,E, HW	
4- The ability to analyze the applicability and accuracy of numerical solutions to diverse mechanical engineering problems	Link						3	
	Assess						Q,E, HW	
5- Synthesize multiple program modules into larger program packages	Link	2						
	Assess	Q,E, HW						
6- Detail numerical results into a readable format that answers specific mechanical engineering analysis and design questions	Link	3					3	
	Assess	Q,E, HW					Q,E, HW	

Assessment Key- **E:** Exam, **H:** Homework, **Q:** Quiz, **P:** Project, **DP:** Design Project, **R:** Research, **T**: Teamwork, **PT**: Practical Training, **FW:** Field Work, **PR:** Presentation, **RE:** Report, **S:** Survey, **SE:** Seminar, **W:** Workshop, **C:** Conference, **O:** Other

Weekly Distribution of Course Topics/Contents

Week	Topic	Comments*	CLO
1.	Programming structures, variables/data types, read /write/print statements,		**1**
2.	Programming structures, variables/data types, read /write/print statements,		**1**
3.	IF Statements.		**1,2**
4.	IF Statements.		**1,2**
5.	Do Loops.		**1,2**
6.	Do Loops.		**1,2**
7.	File Input and output and formatting		**6**
8.	Med Course Exam		**1,2,6**
9.	Arrays and Matrices		**2,4**
10.	Arrays and Matrices		**2,4**
11.	Subroutines and Functions		**2,5**
12.	Programs for Engineering Applications		**2,5**
13.	Programs for Engineering Applications		**2,3**
14.	Programs for Engineering Applications		**2,3**
15.	Programs for Engineering Applications		**2,3**
16.	Final Exam		**2,3,4,5**

* In the comments, you can add the relevant chapter or notes, etc.

Scheduling of laboratory and other non-lecture sessions, including online sessions, as appropriate (if applicable)

Week	Topic	Comments	CLO
1	Programming structures, variables/data types, read /write/print statements,		**1**
2	IF Statements Program		**1,2**
3	Do Loops Program		**1,2**
4	File Input and output and formatting		**6**
5	Arrays and Matrices Program		**2,4**
6	Subroutines and Functions		**2,5**
7	Programs for Engineering Applications		**2,5**
8	Programs for Engineering Applications		**2,3**
9	Programs for Engineering Applications		**2,3**
10	Programs for Engineering Applications		**2,3**

Information on out-of-class assignments with due dates for submission

Assignment/Activity	Due Date	Comments
Exam1	Week 8	
Exam2	Week 16	

Students' Assessment:

Students are assessed as follows:

Assessment Tool(s)**	Date	Weight (%)
Semester activities. These include quizzes, classroom interactions		30
Mid semester exam		20
Practical sessions		-
Final Exam		50
Total		

** You can modify / add other tools relevant to the course.

Course Outcome Assessment Plan:

CLOs	Teaching/Learning Method(s)	Assessment Tool(s)	Threshold
1- Ability to write simple program modules to implement single numerical methods and algorithms.	Lectures and tutorials	**Q,E,HW**	50% pass
2- Ability to calculate solutions to mechanical engineering problems using standard numerical methods	Lectures and tutorials	**Q,E,HW**	50% pass
3- Test program output for accuracy using hand calculations and debugging techniques applications.	Lectures and tutorials	**Q,E,HW**	50% pass
4- The ability to analyze the applicability and accuracy of numerical solutions to diverse mechanical engineering problems	Lectures and tutorials	**Q,E,HW**	50% pass
5- Synthesize multiple program modules into larger program packages	Lectures and tutorials	**Q,E,HW**	50% pass
6- Detail numerical results into a readable format that answers specific mechanical engineering	Lectures and tutorials	**Q,E,HW**	50% pass

analysis and design questions			

Teaching and Learning Resources:

Text Book(s):

1. University of DuhramITS,"An Introduction to Programming in FORTRAN90",2007

Recommended Readings:

1. J.Adams,"Fortran 90 Handbook",Mc-Graw Hill Book Company 1992.
2. Ian D.Chivers," Introduction to Programming with Fortran",Springer ,2006.

Other Resources:

Attendance policy:

Attendance is compulsory. A student missing 3% of the total allocated course hours will receive 1st warning notice and a student missing 7% will receive 2nd warning notice. A student missing 10% will be forced to withdraw and considered failed for the current academic year (in accordance with the university regulations).

Plagiarism/Cheating:

Students are expected to do their own work. You are allowed to work on assignments in teams only if specified by the instructor. In other words, students are encouraged to communicate about general principles of the course, but all assigned homework must be done on an individual basis. The instructor is available to provide any assistance that you may need. Cheating is considered a serious offense by the university. You should be aware of the severe penalty for cheating.

Notes:

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COURSE SYLLABUS

CALCULUS IV
ME2202

2nd (Spring) Semester, 2021/ 2022

COURSE SYLLABUS

Course Title	Calculus IV		
Course Code	ME 2202		
Credit Hours	4		
Pre-requisite(s)	Calculus II(ME1205), Calculus III (ME2201)		
Co-requisite(s)	-		
Semester	2nd (Spring)	**Year**	2021-2022
Instructors Name	Abdulrahman Mohammed Homadi, PhD		
Office Location	ME		
Tel. No.	00964 7802104019		
Email	abd.mohammed@uoanbar.edu.iq		
Lecture Times	10:30AM-12:30PM and 12:30 PM- 2:30 PM Sunday, 10:30 AM-12:30PM and 12:30PM-2:30PM Thursday		
Office Hours	9:00AM-10:00AM Sunday, 8:30AM-12:30PM Monday		

Course Description (as in the catalogue):

Multiple Integrals (double and triple integrals). Laplace transforms and Inverse Laplace transforms. Systems of linear differential equations. Series solutions. Partial differential equations.

Course Objectives/Goals (optional):

Course Learning Outcomes (CLO):

By the end of successful completion of this course, the student will be able to:

1. Recognize double integrals over the rectangle and non-rectangle regions.
2. Determine transformation of a double integral, solve double integral in polar form and identify triple integral.
3. Identify the main definitions and properties of Laplace and inverse Laplace transforms.
4. Discover rules of partial fractions and special functions.
5. Determine system of Linear Differential Equations and solving systems by Laplace transforms.
6. Discover and use Series Solutions.

7. Format and solve Partial Differential Equations.

Alignment of Course Student Learning Outcomes to Program Student Learning Outcomes

CLOs		SOs (ABET) / NGOs (INAC)						
		1/i	2/ii	6/iii	3/iv	4/v	7/vi	5/vii
1. Recognize double integrals over the rectangle and non-rectangle regions .	Link	5						
	Assess	H, Q, E						
2. Determine transformation of a double integral, solve double integral in polar form and identify triple integral.	Link	5						
	Assess	H, Q, E						
3. Identify the main definitions and properties of Laplace and inverse Laplace transforms.	Link	5						
	Assess	H, E						
4. Discover rules of partial fractions and special functions.	Link	5						
	Assess	H, Q, E						
5. Determine system of Linear Differential Equations and solving systems by Laplace transforms.	Link	5						
	Assess	H, Q, E						
6. Discover and use Series Solutions.	Link	5						
	Assess	H, E						
7. Format and solve Partial Differential Equations.	Link	5						
	Assess	H, Q, E						

Assessment Key- E: Exam, **H:** Homework, **Q:** Quiz, **P:** Project, **DP:** Design Project, **R:** Research, **T**: Teamwork, **PT**: Practical Training, **FW:** Field Work, **PR:** Presentation, **RE:** Report, **S:** Survey, **SE:** Seminar, **W:** Workshop, **C:** Conference, **O:** Other

Course Topics/Contents

Week	Topic	Comments*	Course CLO
1.	Properties of double integrals.		1
2.	Double integrals over rectangle regions.		1
3.	Double integrals over the non-rectangle region: areas of non-rectangle regions in the plane, areas of non-rectangle regions in space.		1
4.	Transformation of a double integral, Double integral in polar form		2
5.	Triple Integrals		2
6.	Main definitions and properties: linearity, shifting, derivative, integral, multiplication, division, the initial and final value. Solving initial value problems		3
7.	Laplace transforms of some basic functions. Inverse Laplace transforms, rules of partial fractions.		4,5

Week	Topic	Comments*	Course CLO
8.	Special functions: Heavy side unit step function, Periodic function, Dirac delta function,		**5**
9.	Convolution theorem		**5**
10.	Definitions, Elimination method, Application of Linear Algebra.		**6**
11.	Homogeneous linear systems, solving systems by Laplace transforms.		**6**
12.	Cauchy-Euler equations, Solutions about ordinary points, Solutions about singular points.		**7**
13.	Method of Frobenius, Second solutions and Logarithm terms		**7**
14.	Some mathematical models, Method of separation of variables.		**7**
15.	The D'Alembert solution, Fourier series solutions, Applications.		**7**
16.	**Final Exam**		

* In the comments, you can add the relevant chapter or notes, etc.

Scheduling of laboratory and other non-lecture sessions, including online sessions, as appropriate (if applicable)

Week	Topic	Comments

Information on out-of-class assignments with due dates for submission

Assignment/Activity	Due Date	Comments

Students' Assessment:

Students are assessed as follows:

Assessment Tool(s)**	Date	Weight (%)
Monthly Exm	Weeks 5, 10,14	24
Quizzes	Weeks 2,4, 7,9,12,13	10
Homework	Weeks 4,9,13	6
Lab	-	0-
Final Exam	Week 16	60
Total		**100**

** You can modify / add other tools relevant to the course.

Course Outcome Assessment Plan:

Course SLOs	Teaching/Learning Method(s)	Assessment Tool(s)	Performance Indicators
1	**Lectures and tutorials**	**E, H, Q**	**50% pass**
2	**Lectures and tutorials**	**E, H, Q**	**50% pass**
3	**Lectures and tutorials**	**E, H**	**50% pass**
4	**Lectures and tutorials**	**E, H, Q**	**50% pass**
5	**Lectures and tutorials**	**E, H, Q**	**50% pass**
6	**Lectures and tutorials**	**E, H**	**50% pass**
7	**Lectures and tutorials**	**E, H, Q**	**50% pass**
8	**Lectures and tutorials**	**E, H, Q**	

E: Exam, **H:** Homework, **Q:** Quiz, **P:** Project, **DP:** Design Project, **R:** Research, **T**: Teamwork, **PT**: Practical Training, **FW:** Field Work, **PR:** Presentation, **RE:** Report, **S:** Survey, **SE:** Seminar, **W:** Workshop, **C:** Conference, **O:** Other

Teaching and Learning Resources:

Text Book(s):

Calculus, by Thomas, G.B., Finney, R.L., Weir, M.D. and Giordano, F.R., 2003.

Recommended Readings:

Other Resources:

Course supplements will be used to present extra information not covered in the textbook.

Attendance policy:

Attendance is compulsory. A student missing 3% of the total allocated course hours will receive 1st warning notice and a student missing 7% will receive 2nd warning notice. A student missing 10% will be forced to withdraw and considered failed for the current academic year (in accordance with the university regulations).

Plagiarism/Cheating:

Students are expected to do their own work. You are allowed to work on assignments in teams only if specified by the instructor. In other words, students are encouraged to communicate about general principles of the course, but all assigned homework must be done on an individual basis. The instructor is available to provide any assistance that you may need. Cheating is considered a serious offense by the university. You should be aware of the severe penalty for cheating.

Notes:

Daily homework will be due at the beginning of the next class after it is assigned unless otherwise noted in class. All homework assignments should be turned in before class begins. Work turned in late will be penalized in increments of 10% per day. Work will not be accepted beyond two days late without special coordination affected prior to the due date. Students in this course with disability requiring an accommodation should contact the professor as soon as possible or contact the head of the department.

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COURSE SYLLABUS

COURSE TITLE
Control Systems

Course Code: ME 4309

2nd Semester, 2021 / 2022

COURSE SYLLABUS

Course Title	Control Systems		
Course Code	ME 4309		
Credit Hours	2		
Pre-requisite(s)	ME 2202 Calculus –IV, ME 3301 - Engineering Analysis		
Co-requisite(s)	----------		
Semester	**Second**	**Year**	**2021-2022**
Instructors Name	Dr. Khaldoon F. Brethee		
Office Location	Room ME04– Mechanical Engineering Department.		
Tel. No.	07816664421		
Email	Khaldon77m@uoanbar.edu.iq		
Lecture Times	Sunday, Monday, 10:30-12:30		
Office Hours	Tuesday, Wednesday: 10:30-12:30		

Course Definition

Engineering control is the study of the analysis and regulation of the output behaviors of dynamical systems subject to input signals. It involves the design of engineering products or systems where a requirement is to accurately control some quantity. It is essential for students pursuing degrees in electrical, mechanical, aerospace, biomedical, or chemical engineering. Control systems are found in a broad range of applications within these disciplines, from aircraft and spacecraft to robots and process control systems.

Course Description (as in the catalogue)

1. Demonstrate an understanding of the fundamentals of (feedback) control systems.
2. Determine and use models of physical systems in forms suitable for use in the analysis and design of control systems.
3. Express and solve system equations in state-variable form (state variable models).
4. Determine the time and frequency-domain responses of first and second-order systems to step and sinusoidal (and to some extent, ramp) inputs.
5. Determine the (absolute) stability of a closed-loop control system.
6. Apply root-locus technique to analyze and design control systems.

Course Learning Outcomes:

By the end of successful completion of this course, the student will be able to:

1. Identify open and closed loop control system and formulate mathematical model for physical systems.
2. Interpret and apply block diagram representations of control systems and compute their stability based on Routh array test.
3. Use Evans root locus techniques in control design for real world systems and analyze the performance of system using Frequency response methods
4. Learn how to identify various measurement systems, errors of measurement, as well as explain working principles of sensors and transducers.

Alignment of Course Student Learning Outcomes to Program Student Learning Outcomes

CLOs		SOs (ABET) / NGOs (INAC)						
		1/i	2/ii	6/iii	3/iv	4/v	7/vi	5/vii
1. Identify open and closed loop control system and formulate mathematical model for physical systems.	Link	**3**	**2**					
	Assess	**H,Q,E**	**H,E**					
2. Interpret and apply block diagram representations of control systems and compute their stability based on Routh array test.	Link	**2**	**3**					
	Assess	**H,Q,E**	**H,Q,E**					
3. Use Evans root locus techniques in control design for real world systems and analyze the performance of system using Frequency response methods	Link	**3**	**3**					
	Assess	**H,Q,E**	**H,Q,E**					
4. Learn how to identify various measurement systems, errors of measurement, as well as explain working principles of sensors and transducers.	Link	**1**	**2**					
	Assess	**H, E**	**H, E**					

Assessment Key- E: Exam, **H:** Homework, **Q:** Quiz, **P:** Project, **DP:** Design Project, **R:** Research, **T**: Teamwork, **PT**: Practical Training, **FW:** Field Work, **PR:** Presentation, **RE:** Report, **S:** Survey, **SE:** Seminar, **W:** Workshop, **C:** Conference, **O:** Other

Weekly Distribution of Course Topics/Contents

Week	Topic	Comments*	CLO
1.	Introduction to automatic control system	**CH1**	**1**
2.	Representation of control components	**CH1**	**1**
3.	Representation of control systems • - Mass, spring damper system • - Hydraulic system • - Pneumatic system • - Electrical system - Thermal system	**CH1**	**1,2**
4.	Steady-state operation	**CH2**	**1**
5.	Laplace transformer	**CH2**	**1,2**
6.	Transient and steady-state responses	**CH2**	**1,2**
7.	Transient and steady-state responses	**CH2**	**1,2**
8.	Steady-state errors in control systems	**CH2**	**2**
9.	Steady-state errors in control systems	**CH2**	**2**
10.	Stability of control systems	**CH3**	**2**
11.	Stability of control systems	**CH3**	**2**
12.	The rout locus method	**CH4**	**3**
13.	The rout locus method	**CH4**	**3**
14.	Measurement systems	**CH5**	**4**
15.	Measurement systems	**CH5**	**4**
16.	**Final Exam**		

* In the comments, you can add the relevant chapter or notes, etc.

Scheduling of laboratory and other non-lecture sessions, including online sessions, as appropriate (if applicable)

Week	Topic	Comments	CLO

Information on out-of-class assignments with due dates for submission

Assignment/Activity	Due Date	Comments
HW	Week 3	
HW	Week 6	
HW	Week 8	
HW	Week 12	

Students' Assessment:

Students are assessed as follows:

Assessment Tool(s)**	Date	Weight (%)
Semester activities. These include quizzes, classroom interactions, attendance	Week-1-Week-15	15% (Q=10%; int.=3%, att.=2%)
Homework	Week-3, 6, 8 &12	5%
Progressive Exams	Weeks-5, 9 &14	20%
Final Exam	Week-16	60%
Total		**100%**

** You can modify / add other tools relevant to the course.

Course Outcome Assessment Plan:

CLOs	Teaching/Learning Method(s)	Assessment Tool(s)	Threshold
Identify open and closed loop control system and formulate mathematical model for physical systems.	Lectures and tutorials	**E,H,Q**	50% pass
Interpret and apply block diagram representations of control systems and compute their stability based on Routh array test.	Lectures and tutorials	**E,H,Q**	50% pass
Use Evans root locus techniques in control design for real world systems and analyze the performance of system using Frequency response methods	Lectures and tutorials	**E,H,Q**	50% pass
Learn how to identify various measurement systems, errors of measurement, as well as explain working principles of sensors and transducers.	Lectures and tutorials	**E, Q**	50% pass

Teaching and Learning Resources:

Text Book(s):

Ogata, K. (2010). *Modern control engineering* (Vol. 5). Upper Saddle River, NJ: Prentice hall.

Recommended Readings:

1. Automatic Control Engineering, First Edition 1961, by Francis H. Raven, McGraw Hill.
2. Modern Control Systems, Twelfth Edition 2011, by Richard C. Dorf and Robert H. Bishop, Prentice Hall.
3. Measurement Systems Applications and Design, 5th edition 2003, by E. Doebelin, McGraw Hill.

Other Resources:

Attendance policy:

Attendance is compulsory. A student missing 3% of the total allocated course hours will receive 1st warning notice and a student missing 7% will receive 2nd warning notice. A student missing 10% will be forced to withdraw and considered failed for the current academic year (in accordance with the university regulations).

Plagiarism/Cheating:

Students are expected to do their own work. You are allowed to work on assignments in teams only if specified by the instructor. In other words, students are encouraged to communicate about general principles of the course, but all assigned homework must be done on an individual basis. The instructor is available to provide any assistance that you may need. Cheating is considered a serious offense by the university. You should be aware of the severe penalty for cheating.

Notes:

All lecture notes will be posted in the google classroom. Daily homework will be due at the beginning of the next class after it is assigned unless otherwise noted in class. All homework assignments should be turned in before class begins. Work will not be accepted beyond the due date. Written work must be done independently and must accurately represent the work of the student. All exams and quizzes are to be completed independently.

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COURSE SYLLABUS

COURSE TITLE
FUNDAMENTALS OF ELECTRICAL ENGINEERING

Course Code: ME 1206

2nd Semester, 2021 / 2022

COURSE SYLLABUS

Course Title	**FUNDAMENTALS OF ELECTRICAL ENGINEERING**		
Course Code	ME 1206		
Credit Hours	3-2-1-2		
Pre-requisite(s)	None		
Co-requisite(s)			
Semester	2	Year	2021/2022
Instructors Name	Dr.Sattar Sabry		
Office Location	Workshop Unit		
Tel. No.	07814846230		
Email			
Lecture Times	Monday 12:30 BM-2:30 AM		
Office Hours			

Course Description (as in the catalogue):

Electrical engineering is a professional engineering discipline that generally deals with the study and application of electricity, electronics, and electromagnetism. In electrical engineering, we are often interested in communicating or transferring energy from one point to another. To do this requires an interconnection of electrical devices. Such interconnection is referred to as an electric circuit, and each component of the circuit is known as an element.

Course Objectives/Goals (optional):

The goals of this course are to enable students to:

Course Learning Outcomes:

By the end of successful completion of this course, the student will be able to:

1. Explain precisely what the fundamental circuit variables mean
2. Apply Kirchhoff's current and voltage laws, Ohm's law, and the terminal relations describing inductive and capacitive energy-storage elements to circuit problems.
3. Simplify circuits using series and parallel equivalents and using Thevenin and Norton equivalents
4. Explain the physical underpinnings of capacitance and inductance.

Alignment of Course Student Learning Outcomes to Program Student Learning Outcomes

CLOs		SOs (ABET) / NGOs (INAC)						
		1/i	2/ii	6/iii	3/iv	4/v	7/vi	5/vii
Explain precisely what the fundamental circuit variables mean	Link	4		4				
	Assess	E,H,Q		E,H,Q				
Apply Kirchhoff's current and voltage laws, Ohm's law, and the terminal relations describing inductive and capacitive energy-storage elements to circuit problems.	Link	4		4				
	Assess	E,H,Q		E,H,Q				
Simplify circuits using series and parallel equivalents and using The venin and Norton equivalents	Link	4		4				
	Assess	E,H,Q		E,H,Q				
Explain the physical underpinnings of capacitance and inductance.	Link	4		4				
	Assess	E,H,Q		E,H,Q				

Assessment Key- E: Exam, **H:** Homework, **Q:** Quiz, **P:** Project, **DP:** Design Project, **R:** Research, **T**: Teamwork, **PT**: Practical Training, **FW:** Field Work, **PR:** Presentation, **RE:** Report, **S:** Survey, **SE:** Seminar, **W:** Workshop, **C:** Conference, **O:** Other

Weekly Distribution of Course Topics/Contents

Week	Topic	Comments*	CLO
1.	Electrical quantity, resistance (Ohm's law)		**1**
2.	series circuit (voltage divider rule), parallel circuit (current divider rule)		**1**
3.	Series-parallel network. Kirchhoff's voltage law		**1**
4.	Kirchhoff's current law. Delta-star and star-delta conversions		**1,2**
5.	Mesh analysis (Maxwell) determinate. Super position theorem		**1,2**
6.	The venin's theorem. Norton's theorem. Maximum power transfer theorem. A.C. circuit		**2**
7.	Sinusoidal alternating wave form. General format for the sinusoidal voltage or current		**3**
8.	phase relation		**3**
9.	Response of basic R, L, and C elements to sinusoidal voltage or current.		**1,3**
10.	Complex numbers (rectangular and polar form)		**2,3**
11.	Series A.C		**4**
12.	circuit impedance and the phase diagram		**4**
13.	Resonance. Power factor		**4**
14.	Transistor (PNP)-(NPN)		**1,4**
15.	Diode (PN)		**2,4**
16.	**Final Exam**		

* In the comments, you can add the relevant chapter or notes, etc.

Scheduling of laboratory and other non-lecture sessions, including online sessions, as appropriate (if applicable)

Week	Topic	Comments	CLO
1	**How to write a report**		**1**
2	**Employment laboratory instrument**		**1**
3	**Ohms law**		**1**
4	**Kirchhoff's laws**		**2**
5	**Ser-par**		**3**
6	**Combination**		**3**
7	**Delta star connection**		**3**
8	**Superposition theorems**		**2,3**
9	**Theremin's theorems**		**4**
10	**Norton's theorems**		**4**
11	**Impedance element charstristics**		**4**
12	**The series RLC resonance circuit**		**1,4**
13	**The parallel RLC resonance circuit**		**2,3**
14	**Power factor**		**4**
15	**Power factor**		**4**

Information on out-of-class assignments with due dates for submission

Assignment/Activity	Due Date	Comments
HW	Week 4	
HW	Week 7	
HW	Week 9	
HW	Week 12	
HW	Week 14	

Students' Assessment:

Students are assessed as follows:

Assessment Tool(s)**	Date	Weight (%)
Exams		15
Quizzes		9
Homework's		6
Lab		10
Final Exam		60
Total		**100**

** You can modify / add other tools relevant to the course.

Course Outcome Assessment Plan:

CLOs	Teaching/Learning Method(s)	Assessment Tool(s)	Threshold
Explain precisely what the fundamental circuit variables mean	Lectures and tutorials	**E,H,Q**	50% pass
Apply Kirchhoff's current and voltage laws, Ohm's law, and the terminal relations describing inductive and capacitive energy-storage elements to circuit problems.	Lectures and tutorials	**E,H,Q**	50% pass
Simplify circuits using series and parallel equivalents and using The venin and Norton equivalents	Lectures and tutorials	**E,H,Q**	50% pass
Explain the physical underpinnings of capacitance and inductance.	Lectures and tutorials	**E,H,Q**	50% pass

Teaching and Learning Resources:

Text Book(s):

1. Electric Circuits, Basic Electricity by Schaum's Series
2. Electric Machinery Fundamentals by S. Chapman
3. Electrical Power Technology by Theodore Wildi

Attendance policy:

Attendance is compulsory. A student missing 3% of the total allocated course hours will receive 1st warning notice and a student missing 7% will receive 2nd warning notice. A student missing 10% will be forced to withdraw and considered failed for the current academic year (in accordance with the university regulations).

Plagiarism/Cheating:

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need. Cheating is considered a serious offense by the university. You should be aware of the severe penalty for cheating.

Notes:

All lecture notes will be posted in the google classroom. Daily homework will be due at the beginning of the next class after it is assigned unless otherwise noted in class. All homework assignments should be turned in before class begins. Work will not be accepted beyond the due date. Written work must be done independently and must accurately represent the work of the student. All exams and quizzes are to be completed independently.

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COURSE SYLLABUS

COURSE TITLE

Engineering Drawing

Course Code: ME 1208

2nd Semester, 2021 / 2022

COURSE SYLLABUS

Course Title	Engineering Drawing		
Course Code	ME 1208		
Credit Hours	3-2-2-2		
Pre-requisite(s)			
Co-requisite(s)			
Semester	2	Year	2021/2022
Instructors Name	Diyar Ismael Ahmed, PhD		
Office Location			
Tel. No.	0782 425 2227		
Email	diyar.ismael@uoanbar.edu.iq		
Lecture Times	08:30 AM-11:30 AM, T		
Office Hours	8:30 AM-10:00 AM, S and M		

Course Description (as in the catalogue):

This course discusses the fundamental concepts of engineering graphics. It gives also an introduction to computer graphics using CAD software. The following topics are covered: Drawing conventions such as standards, line types and dimensioning; drawing of inclined and curved surfaces; deducting the orthographic views from a pictorial; drawing full and half sections; deducting an orthographic view from given two views; pictorial sketching (isometric and oblique).

Course Objectives/Goals (optional):

The goals of this course are to enable students to:

1. To have the knowledge of interpretation of dimensions of different quadrant projections.

2. To understand the basic principles of engineering drawing.
3. To have the knowledge of generating the pictorial views
4. To understand the development of surfaces

Course Learning Outcomes:

By the end of successful completion of this course, the student will be able to:

1. Prepare and understand drawings.
2. Ability to read and prepare engineering drawings.
3. Ability to make free - hand sketching of objects.

Alignment of Course Student Learning Outcomes to Program Student Learning Outcomes

CLOs		SOs (ABET) / NGOs (INAC)						
		1/i	2/ii	6/iii	3/iv	4/v	7/vi	5/vii
Prepare and understand drawings.	Link	4					2	
	Assess	E,H,Q					E,H,Q	
Ability to read and prepare engineering drawings	Link	4					2	
	Assess	E,H,Q					E,H,Q	
Ability to make free - hand sketching of objects	Link	4					2	
	Assess	E,H,Q					E,H,Q	

Assessment Key- E: Exam, **H:** Homework, **Q:** Quiz, **P:** Project, **DP:** Design Project, **R:** Research, **T**: Teamwork, **PT**: Practical Training, **FW:** Field Work, **PR:** Presentation, **RE:** Report, **S:** Survey, **SE:** Seminar, **W:** Workshop, **C:** Conference, **O:** Other

Weekly Distribution of Course Topics/Contents

Week	Topic	Comments*	CLO
1.	Introduction to engineering drawing	Ch 1	1
2.	Introduction to engineering drawing	Ch 1	1
3.	Using drawing tools	Ch 1	1
4.	Applied geometry	Ch 1	1
5.	Orthographic projection	Ch 1	1
6.	Orthographic writing I	Ch 1	1
7.	Orthographic writing II	Ch 2	1
8.	Pictorial sketching	Ch 2	2
9.	Pictorial sketching	Ch 2	2

Week	Topic	Comments*	CLO
10.	Orthographic reading	**Ch 3**	**3**
11.	Orthographic reading	**Ch 3**	**3**
12.	Dimensioning	**Ch 3**	**3**
13.	Dimensioning	**Ch 3**	**1,3**
14.	Section views	**Ch 4**	**2,3**
15.	Section views	**Ch 4**	**2,3**
16.	**Final Exam**		

* In the comments, you can add the relevant chapter or notes, etc.

Scheduling of laboratory and other non-lecture sessions, including online sessions, as appropriate (if applicable)

Week	Topic	Comments	CLO

Information on out-of-class assignments with due dates for submission

Assignment/Activity	Due Date	Comments
HW	Week 4	
HW	Week 7	
HW	Week 9	
HW	Week 12	
HW	Week 14	

Students' Assessment:

Students are assessed as follows:

Assessment Tool(s)**	Date	Weight (%)
Exams		15
Quizzes		9
Homework's		6
Lab		10
Final Exam		60
Total		

** You can modify / add other tools relevant to the course.

Course Outcome Assessment Plan:

CLOs	Teaching/Learning Method(s)	Assessment Tool(s)	Threshold
Prepare and understand drawings.	Lectures and tutorials	**E,H,Q**	50% pass
Ability to read and prepare engineering drawings	Lectures and tutorials	**E,H,Q**	50% pass
Ability to make free - hand sketching of objects	Lectures and tutorials	**E,H,Q**	50% pass

Teaching and Learning Resources:

Text Book(s):

M Interpreting Engineering Drawings, Jensen, C.H. and Helsel, G.D., 7th ed., Thomson Delmar Learning, 2007

Attendance policy:

Attendance is compulsory. A student missing 3% of the total allocated course hours will receive 1st warning notice and a student missing 7% will receive 2nd warning notice. A student missing 10% will be forced to withdraw and considered failed for the current academic year (in accordance with the university regulations).

Plagiarism/Cheating:

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Notes:

All lecture notes will be posted in the google classroom. Daily homework will be due at the beginning of the next class after it is assigned unless otherwise noted in class. All homework assignments should be turned in before class begins. Work will not be accepted beyond the due date. Written work must be done independently and must accurately represent the work of the student. All exams and quizzes are to be completed independently.

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COURSE SYLLABUS

COURSE TITLE

THEORY OF MACHINES-II

Course Code
ME 3308

2nd Semester, 2021 / 2022

COURSE SYLLABUS

Course Title	Theory of Machines II		
Course Code	ME3308		
Credit Hours	3		
Pre-requisite(s)	ME 3303 - Theory of Machines I		
Co-requisite(s)			
Semester	2	**Year**	2021/ 2022
Instructors Name	Ahmed N. Uwayed		
Office Location	ME Building, Room No.2		
Tel. No.	07804928100		
Email	ahmed.noori@uoanbar.edu.iq		
Lecture Times	Sunday, 8:30am-10:30am Tuesday, 8:30am-9.30am		
Office Hours	8:30 am -10:30pm; Monday, and 9:30 am -11:30pm Tuesday		

Course Description (as in the catalogue)

This course introduces students to the principles and development of machinery. Using a systematic approach, the course will grant students' knowledge of the basic rules of machines and also ground the student in the regions of specialization within the discipline. Students will learn the various types of mechanisms and machines. The course will explore the applications of such phenomena like friction, energy transformation, etc. in the field of machinery.

Course Objectives/Goals (optional)

The main objectives for this course are:

1. To give basic knowledge on kinematics and kinetics of machine elements.
2. Understand the principles of power transmission.
3. To teach students both graphical and analytical methods of motion analysis and design of planar mechanisms.

4. Understand of techniques for studying angular and linear motion of rotating machines.
5. By the end of this course student will be able to achieve complete analysis of mechanism including (cams, gears, gear trains, and belt drive)

Course Learning Outcomes:

Upon the successful completion of this course, students will be able to:

1. To gain basic knowledge of kinematics and kinetics for planar mechanisms.
2. Apply the kinematic analysis in subsequent courses in the design and analysis of various machine components.
3. Identify gear and gear train parameters and perform analysis and kinematical design of gear trains.
4. To learn the analysis and design of cam system and perform static and dynamic balancing of rotating machinery.

Alignment of Course Student Learning Outcomes to Program Student Learning Outcomes

CLOs		SOs (ABET) / NGOs (INAC)						
		1/i	2/ii	6/iii	3/iv	4/v	7/vi	5/vii
1.To gain basic knowledge of kinematics and kinetics for planar mechanisms.	Link	3	3					
	Assess	H,Q	H,Q					
2. Apply the kinematic analysis in subsequent courses in the design and analysis of various machine components	Link	4	3	3				
	Assess	H,Q, E	H,Q, E	H, RE				
3. Identify gear and gear train parameters and perform analysis and kinematical design of gear trains.	Link	4	2	2				
	Assess	H,Q, E	H,Q, E	H, RE				
4.To learn the analysis and design of cam system and perform static and dynamic balancing of rotating machinery.	Link	4	3					
	Assess	H,Q, E	H,Q, E					

E: Exam, **H:** Homework, **Q:** Quiz, **P:** Project, **DP:** Design Project, **R:** Research, **T**: Teamwork, **PT**: Practical Training, **FW:** Field Work, **PR:** Presentation, **RE:** Report, **S:** Survey, **SE:** Seminar, **W:** Workshop, **C:** Conference, **O:** Other

Weekly Distribution of Course Topics/Contents

Week	Topic	Comments*	Course CLO
1	Balancing of rotating masses	**Ch. 1**	**1, 2**
2	Balancing of rotating masses	**Ch. 1**	**1, 2**
3	Balancing of rotating masses	**Ch. 1**	**1, 2**
4	Spur Gearing	**Ch. 2**	**3**
5	Spur Gearing	**Ch. 2**	**3**
6	Spur Gearing	**Ch. 2**	**3**
7	Gear trains	**Ch. 3**	**4**
8	Gear trains	**Ch. 3**	**4**
9	Gear trains	**Ch. 3**	**4**
10	Belt drive	**Ch. 4**	**4**
11	Belt drive	**Ch. 4**	**4**
12	Belt drive	**Ch. 4**	**4**
13	Belt drive	**Ch. 4**	**4**
14	Cams	**Ch. 5**	**4**
15	Cams	**Ch. 5**	**4**
16	**Final Exam**		

* In the comments, you can add the relevant chapter or notes, etc.

Scheduling of laboratory and other non-lecture sessions, including online sessions, as appropriate (if applicable)

Week	Topic	Comments
1	Statistical procedure to find the best fit for a set of experimental data.	**Students are set up in three groups (A, B, and C)**
2	Statistical procedure to find the best fit for a set of experimental data.	
3	Statistical procedure to find the best fit for a set of experimental data.	
4	Static balancing of rotating masses.	
5	Static balancing of rotating masses.	
6	Static balancing of rotating masses.	
7	Dynamic balancing of rotating masses.	
8	Dynamic balancing of rotating masses.	
9	Dynamic balancing of rotating masses.	
10	Determination of moment of inertia of a flywheel.	
11	Determination of moment of inertia of a flywheel.	
12	Determination of moment of inertia of a flywheel.	

13	Cams.	
14	Cams.	
15	-	

Information on out-of-class assignments with due dates for submission

Assignment/Activity	Due Date	Comments
H.W.	Week 3	
H.W.	Week 6	
H.W.	Week 10	
H.W.	Week 13	
H.W.	Week 14	

Students' Assessment:

Students are assessed as follows:

Assessment Tool(s)**	Date	Weight (%)
Progress exams		24
Quizzes		10
Homework's		6
Lab		10
Final Exam		50
Total		**100%**

** You can modify / add other tools relevant to the course.

Course Outcome Assessment Plan:

#	Course SLOs	Teaching/Learning Method(s)	Assessment Tool(s)	Performance Indicators
1	To gain basic knowledge of kinematics and kinetics for planar mechanisms.	Lectures and tutorials	H, Q	50% pass
2	Apply the kinematic analysis in subsequent courses in the design and analysis of various machine components	Lectures and tutorials	H, Q, E, RE	50% pass
3	Identify gear and gear train parameters and perform analysis and kinematical design of gear trains.	Lectures and tutorials	H, Q, E, RE	50% pass
4	To learn the analysis and design of cam system and perform static and dynamic	Lectures and tutorials	H, Q, E	50% pass

Teaching and Learning Resources:

Text Book(s):

1. Mechanics of Machines: Elementary theory and examples. By: J. Hannah and R.C. Stephens.
2. Mechanics of Machines: Advanced theory and examples. By: J. Hannah and R.C. Stephens.

Recommended Readings:

3. Kinematics and Dynamics of Machines. By: G.H. Martin.
4. Theory of Machine. By: R.S. Khurmi and J. K. Gupta.

Other Resources:

Attendance policy:

Attendance is compulsory. A student missing 3% of the total allocated course hours will receive 1st warning notice and a student missing 7% will receive final warning notice. A student missing 10% will be forced to withdraw and considered failed for this course and the current academic year (in accordance with the university regulations).

Plagiarism/Cheating:

Students are expected to do their own work. You are allowed to work on assignments in teams only if specified by the instructor. In other words, students are encouraged to communicate about general principles of the course, but all assigned homework must be done on an individual basis. The instructor is available to provide any assistance that you may need. Cheating is considered a serious offense by the university. You should be aware of the severe penalty for cheating.

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COURSE SYLLABUS

Course Title:

MANUFACTURING PROCESSES

Course Code: ME 3305

2nd Semester, 2021 / 2022

COURSE SYLLABUS

Course Title	Manufacturing Processes		
Course Code	ME 3305		
Credit Hours	(3-3-1-0)		
Pre-requisite(s)	Physics -1 ME 1203, Chemistry ME 1205		
Co-requisite(s)			
Semester	2	**Year**	2021-2022
Instructors Name	Dr. zinah Jumaah Ahmed		
Office Location	Room MECR 17– Mechanical Engineering Department.		
Tel. No.	07736526196		
Email	Zinah.j.ahmed@uoanbar.edu.iq		
Lecture Times	Monday, 10:30-12:30, Wednesday 9:30-11:30		
Office Hours	Monday 8:30 AM-10:00 AM and Wednesday 8:30 AM-9:30 AM and 11:30 AM-1:30 PM		

Course Description (as in the catalogue):

industrial safety, measuring instruments, the production or Extraction of metallic materials (ferrous and nonferrous), manufacturing operations, basic - plumbing, sand, die and Centrifugal Casting. Deformation process (Rolling, forging, Extrusion, wire and rod Drawing and sheet metal deformation). Metal Machining (turning, drilling, and milling). Welding process (Arc welding, gas welling and spot welling).

Course Learning Outcomes:

By the end of successful completion of this course, the student will be able to:

1. To gain information about different bulk deformation processes (forging, rolling,

extrusion, drawing)

2. To gain knowledge about the nonconventional machining processes
3. An ability to understand the theory of metal machining

Alignment of Course Student Learning Outcomes to Program Student Learning Outcomes

CLOs		SOs (ABET) / NGOs (INAC)						
		1/i	2/ii	6/iii	3/iv	4/v	7/vi	5/vii
To gain information about different bulk deformation processes (forging, rolling, extrusion, drawing)	Link		4	4				
	Assess		H, Q	H, Q,				
To gain knowledge about the nonconventional machining processes	Link		4					
	Assess		H, Q, RE					
An ability to understand the theory of metal machining	Link	5		5				
	Assess	H, Q, E		H, Q, E				
	Link							
	Assess							

Assessment Key- E: Exam, **H:** Homework, **Q:** Quiz, **P:** Project, **DP:** Design Project, **R:** Research, **T**: Teamwork, **PT**: Practical Training, **FW:** Field Work, **PR:** Presentation, **RE:** Report, **S:** Survey, **SE:** Seminar, **W:** Workshop, **C:** Conference, **O:** Other

Weekly Distribution of Course Topics/Contents

Week	Topic	Comments*	CLO
1.	Tensile properties		1, 3
2.	Compression properties		1, 3
3.	Shear properties		1, 3
4.	Hardness		3
5.	Effect of Temperature on Properties		2,3
6.	Fluid Properties		2
7.	Bulk deformation		1
8.	Rolling		1
9.	Rolling		1, 3
10.	Forging		1
11.	Forging		1, 3
12.	Extrusion		1
13.	Extrusion		1, 3
14.	WIRE AND BAR DRAWING		1
15.	Examination		
16.	**Final Exam**		

* In the comments, you can add the relevant chapter or notes, etc.

Scheduling of laboratory and other non-lecture sessions, including online sessions, as appropriate (if applicable)

Week	Topic	Comments

Information on out-of-class assignments with due dates for submission

Assignment/Activity	Due Date	Comments
RE	Week 8	

Students' Assessment:

Students are assessed as follows:

Assessment Tool(s)**	Date	Weight (%)
Exams		24
Quizzes		10
Homework's		4
Report		2
Final Exam		60
Total		100

** You can modify / add other tools relevant to the course.

Course Outcome Assessment Plan:

Course SLOs	Teaching/Learning Method(s)	Assessment Tool(s)	Performance Indicators
To gain information about different bulk deformation processes (forging, rolling, extrusion, drawing)	Lectures and tutorials	H, Q, RE	50% pass
To gain knowledge about the nonconventional machining processes	Lectures and tutorials	H, Q	50% pass
An ability to understand the theory of metal machining	Lectures and tutorials	H, Q, E	50% pass

Teaching and Learning Resources:

Text Book(s):

- Fundamentals of Modern Manufacturing" Fourth Edition by Mikell P. Groover
- Manufacturing Engineering and Technology by Kalpakjian
- Materials and Processes in Manufacturing by E.P Degarmo

Attendance policy:

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Notes:

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COURSE SYLLABUS

Course Title:

ENGLISH LANGUAGE IV

Course Code: ME4101

2nd Semester, 2021 / 2022

COURSE SYLLABUS

Course Title	English Language IV		
Course Code	ME 4101		
Credit Hours	2		
Pre-requisite(s)	ME 3101- English Language-III		
Co-requisite(s)			
Semester	2	**Year**	2021-2022
Instructors Name	Dr. zinah Jumaah Ahmed		
Office Location	Room MECR 17– Mechanical Engineering Department.		
Tel. No.	07736526196		
Email	Zinah.j.ahmed@uoanbar.edu.iq		
Lecture Times	Thursday, 12:30-2:30 PM		
Office Hours	Monday 8:30 AM-10:00 AM and Wednesday 8:30 AM-9:30 AM and 11:30 AM-1:30 PM		

Course Description (as in the catalogue):

In general, this course (English language) is devoted to achieve the academic oral and written communication to the standard required at university level. Within this course, all of essential English skills (Reading, Listening, Speaking and writing) are developed. An integrated syllabus, motivating topics and clearly focused tasks together with what has done in classroom enable students to apply critical thinking skills to a wide range of challenging subjects from diverse scientific disciplines. Course activities include writing different types of topics (academic reports, emails& letters and so on), acquiring advanced academic vocabulary, and getting involved in group discussions and debates. In addition, the course also includes other skills to consolidate the main skills, such as further readings in mechanical engineering.

Course Learning Outcomes:

By the end of successful completion of this course, the student will be able to:

1. Reading and comprehending expressions, simple and complex texts.
2. Promoting students' ability to speak through groups' discussion and debates.
3. Integrating the use of the Reading, Listening, Speaking, Writing language skills.
4. Demonstrating control of essential grammatical structures by learning the style and structure of effective sentences.
5. Support a classroom community that involves constructive exchange of ideas in order to expand academic vocabulary.

Alignment of Course Student Learning Outcomes to Program Student Learning Outcomes

CLOs		SOs (ABET) / NGOs (INAC)						
		1/i	2/ii	6/iii	3/iv	4/v	7/vi	5/vii
Reading and comprehending expressions, simple and complex texts.	Link				4			
	Assess				H, Q, E			
Promoting students' ability to speak through groups' discussion and debates.	Link				3			
	Assess				H, Q			
Integrating the use of the Reading, Listening, Speaking, Writing language skills.	Link				5			
	Assess				H, Q, R E			
Demonstrating control of essential grammatical structures by learning the style and structure of effective sentences.	Link				1			
	Assess				H, Q, E			
Support a classroom community that involves constructive exchange of ideas in order to expand academic vocabulary.	Link				2			
	Assess				H, Q, E			
	Link							
	Assess							

Assessment Key- E: Exam, **H:** Homework, **Q:** Quiz, **P:** Project, **DP:** Design Project, **R:** Research, **T**: Teamwork, **PT**: Practical Training, **FW:** Field Work, **PR:** Presentation, **RE:** Report, **S:** Survey, **SE:** Seminar, **W:** Workshop, **C:** Conference, **O:** Other

Weekly Distribution of Course Topics/Contents

Week	Topic	Comments*	CLO
1.	Unit 1: No place like home		1, 2, 3, 4, 5
2.	Unit 2: Been there, done that!		1, 2, 3, 4, 5
3.	Unit 3: What a story!		1, 2, 3, 4, 5
4.	Unit 4: Nothing but the truth		1, 2, 3, 4, 5
5.	Unit 5: An eye to the future		1, 2, 3, 4, 5
6.	Unit 6: Making it big		1, 2, 3, 4, 5
7.	Unit 7: Getting on together		1, 2, 3, 4, 5
8.	Unit 8: Going to extremes		1, 2, 3, 4, 5
9.	Unit 9: Things aren't what they used to be!		1, 2, 3, 4, 5
10.	Unit 9: Things aren't what they used to be!		1, 2, 3, 4, 5
11.	Unit 10: Risking life and limb		1, 2, 3, 4, 5
12.	Unit 10: Risking life and limb		1, 2, 3, 4, 5
13.	Unit 11: In your dreams		1, 2, 3, 4, 5
14.	Unit 12: It's never too late		1, 2, 3, 4, 5
15.	Unit 12: It's never too late		1, 2, 3, 4, 5
16.	**Final Exam**		

* In the comments, you can add the relevant chapter or notes, etc.

Scheduling of laboratory and other non-lecture sessions, including online sessions, as appropriate (if applicable)

Week	Topic	Comments

Information on out-of-class assignments with due dates for submission

Assignment/Activity	Due Date	Comments
HW	Week 4	
HW	Week 7	
RE	Week 8	
HW	Week 9	
HW	Week 12	

Students' Assessment:

Students are assessed as follows:

Assessment Tool(s)**	Date	Weight (%)
Exams		24
Quizzes		10
Homework's		4
Report		2
Final Exam		60
Total		100

** You can modify / add other tools relevant to the course.

Course Outcome Assessment Plan:

Course SLOs	Teaching/Learning Method(s)	Assessment Tool(s)	Performance Indicators
Reading and comprehending expressions, simple and complex texts	Lectures and tutorials	H, Q, E	50% pass
Promoting students' ability to speak through groups' discussion and debates.	Tutorials	H, Q	50% pass
Integrating the use of the Reading, Listening, Speaking, Writing language skills.	Lectures and tutorials	H, Q, RE	50% pass
Demonstrating control of essential grammatical structures by learning the style and structure of effective sentences.	Lectures and tutorials	H, Q, E	50% pass
Support a classroom community that involves constructive exchange of ideas in order to expand academic vocabulary	Lectures and tutorials	H, Q, E	50% pass

Teaching and Learning Resources:

Text Book(s):

- Soars, John and Liz, (2011), New Headway Plus, Special Edition, (Plus/ Upper-Intermediate Level, Oxford University Press

Attendance policy:

Attendance is compulsory. A student missing 3% of the total allocated course hours will receive 1st warning notice and a student missing 7% will receive 2nd warning notice. A student missing 10% will be forced to withdraw and considered failed for the current academic year (in accordance with the university regulations).

Plagiarism/Cheating:

Students are expected to do their own work. You are allowed to work on assignments in teams only if specified by the instructor. In other words, students are encouraged to communicate about general principles of the course, but all assigned homework must be done on an individual basis. The instructor is available to provide any assistance that you may need. Cheating is considered a serious offense by the university. You should be aware of the severe penalty for cheating.

Notes:

All lecture notes will be posted in the google classroom. Daily homework will be due at the beginning of the next class after it is assigned unless otherwise noted in class. All homework assignments should be turned in before class begins. Work will not be accepted beyond the due date. Written work must be done independently and must accurately represent the work of the student. All exams and quizzes are to be completed independently.

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COURSE SYLLABUS

COURSE TITLE

Design of Machine Elements II

Course Code: ME 4306

2nd Semester, 2021 / 2022

COURSE SYLLABUS

Course Title	Design of Machine Elements II		
Course Code	ME 4306		
Credit Hours	3		
Pre-requisite(s)	ME 4301 Design of Machine Elements-I		
Co-requisite(s)			
Semester	2	Year	2021/2022
Instructors Name	Arz Yahya Rzayyig, PhD		
Office Location			
Tel. No.	07835556246		
Email	arzrzayeg@uoanbar.edu.iq		
Lecture Times	10:30 AM-12:30 AM, S and T		
Office Hours	8:30 AM-10:00 AM and 12:30 PM-1:30 PM, S and T		

Course Description (as in the catalogue):

Fundamentals of gears are included to address the design of compound gear trains to achieve specified gear ratios. The discussion of the relationship between torque, speed, and power is clarified. Design of rolling bearing introduces the invariant, the statistical distribution of life as well as some useful deterministic equations addressing load versus life at constant reliability. The importance of lubrication in reducing friction, wear, and heating of machine parts that move relative to each other is explained. Recent metallurgy developments in bearing materials combined with increased knowledge of the lubrication process give a possibility to design journal bearings with satisfactory lives with very good reliabilities. This course discusses the more frequently used types of springs, their necessary parametric relationships, and their design. Moreover, the course provides a classical treatment on the design of machine elements such as brakes, clutches, and flywheels, and their applications by presenting established design methodologies as set by the appropriate organizations.

Course Objectives/Goals (optional):

The goals of this course are to enable students to:

1. To introduce students to the design and theory of common machine elements and to give students experience in solving design problems involving machine elements.
2. To combine forces, moments, torques, stress and strength information to develop ability to analyze, design and/or select machine elements. With attention to safety, reliability, and societal and fiscal aspects.
3. To require the student to prepare professional quality solutions and presentations to effectively communicate the results of analysis and design.
4. To be acquainted with standards, safety, reliability, importance of dimensional parameters and manufacturing aspects in mechanical design.

Course Learning Outcomes:

By the end of successful completion of this course, the student will be able to:

1. Recognize the fundamentals of the theory of lubrication and journal bearings
2. Design of specific mechanical elements including: gears, gear trains, clutches, coupling, brakes, springs, ropes and chains drives.
3. Recognize the fundamentals of the Rolling-Contact Bearings.
4. Design and evaluation of a machine component that is created to satisfy a specific need. Also, gain an appreciation for and become proficient in applying the final steps of the engineering design process.

Alignment of Course Student Learning Outcomes to Program Student Learning Outcomes

CLOs		SOs (ABET) / NGOs (INAC)						
		1/i	2/ii	6/iii	3/iv	4/v	7/vi	5/vii
Recognize the fundamentals of the theory of lubrication and journal bearings	Link		4					
	Assess		E,H,Q					
Design of specific mechanical elements including: gears, gear trains, clutches, coupling, brakes, springs, ropes and chains drives	Link		4					
	Assess		E,H,Q					
Recognize the fundamentals of the Rolling-Contact Bearings.	Link		2					
	Assess		E,H,Q					
Design and evaluation of a machine component that is created to satisfy a specific need. Also, gain an appreciation for and become proficient in applying the final steps of the engineering design process.	Link		2					
	Assess		E,H,Q					

Assessment Key- E: Exam, **H:** Homework, **Q:** Quiz, **P:** Project, **DP:** Design Project, **R:** Research, **T**: Teamwork, **PT**: Practical Training, **FW:** Field Work, **PR:** Presentation, **RE:** Report, **S:** Survey, **SE:** Seminar, **W:** Workshop, **C:** Conference, **O:** Other

Weekly Distribution of Course Topics/Contents

Week	Topic	Comments*	CLO
1.	Mechanical Springs	Ch 1	1
2.	Mechanical Springs	Ch 1	1
3.	Mechanical Springs	Ch 1	1
4.	Rolling-Contact Bearings	Ch 2	1
5.	Rolling-Contact Bearings	Ch 2	1
6.	Rolling-Contact Bearings	Ch 2	1
7.	Lubrication and Journal Bearings	Ch 3	1
8.	Lubrication and Journal Bearings	Ch 3	2
9.	Lubrication and Journal Bearings	Ch 3	2
10.	Gears-General	Ch 4	3
11.	Gears-General	Ch 4	3
12.	Spur, Helical, Bevel, and Worm Gears	Ch 5	3
13.	Spur, Helical, Bevel, and Worm Gears	Ch 5	4
14.	Clutches, Brakes, Couplings, and Flywheels	Ch 6	4
15.	Clutches, Brakes, Couplings, and Flywheels	Ch 6	4
16.	**Final Exam**		

* In the comments, you can add the relevant chapter or notes, etc.

Scheduling of laboratory and other non-lecture sessions, including online sessions, as appropriate (if applicable)

Week	Topic	Comments	CLO

Information on out-of-class assignments with due dates for submission

Assignment/Activity	Due Date	Comments
HW	Week 4	
HW	Week 7	
HW	Week 9	
HW	Week 12	
HW	Week 14	

Students' Assessment:

Students are assessed as follows:

Assessment Tool(s)**	Date	Weight (%)
Exams		24
Quizzes		10
Homework's		6
Lab		0
Final Exam		60
Total		

** You can modify / add other tools relevant to the course.

Course Outcome Assessment Plan:

CLOs	Teaching/Learning Method(s)	Assessment Tool(s)	Threshold
Recognize the fundamentals of the theory of lubrication and journal bearings	Lectures and tutorials	**E,H,Q**	50% pass
Design of specific mechanical elements including: gears, gear trains, clutches, coupling, brakes, springs, ropes and chains drives	Lectures and tutorials	**E,H,Q**	50% pass
Recognize the fundamentals of the Rolling-Contact Bearings.	Lectures and tutorials	**E,H,Q**	50% pass
Design and evaluation of a machine component that is created to satisfy a specific need. Also, gain an appreciation for and become proficient in applying the final steps of the engineering design process.	Lectures and tutorials	**E,H,Q**	50% pass

Teaching and Learning Resources:

Text Book(s):
Mechanical Engineering Design By Shigley, 8th Edition,2008.

Recommended Readings:
1. Shigley's Mechanical Engineering Design, 9th Edition, 2011.
2. Shigley's Mechanical Engineering Design, 10th Edition, 2015.
3. Shigley's Mechanical Engineering Design, 11th Edition, 2020.

Other Resources:
Machine Design By Khurmi, Fourteenth Edition, 2005.

Attendance policy:

Attendance is compulsory. A student missing 3% of the total allocated course hours will receive 1st warning notice and a student missing 7% will receive 2nd warning notice. A student missing 10% will be forced to withdraw and considered failed for the current academic year (in accordance with the university regulations).

Plagiarism/Cheating:

Students are expected to do their own work. You are allowed to work on assignments in teams only if specified by the instructor. In other words, students are encouraged to communicate about general principles of the course, but all assigned homework must be done on an individual basis. The instructor is available to provide any assistance that you may need. Cheating is considered a serious offense by the university. You should be aware of the severe penalty for cheating.

Notes:

All lecture notes will be posted in the google classroom. Daily homework will be due at the beginning of the next class after it is assigned unless otherwise noted in class. All homework assignments should be turned in before class begins. Work will not be accepted beyond the due date. Written work must be done independently and must accurately represent the work of the student. All exams and quizzes are to be completed independently.

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COURSE SYLLABUS

COURSE TITLE
Engineering Mechanics (Static)

Course Code: ME 1205

2nd Semester, 2021 / 2022

COURSE SYLLABUS

Course Title	Engineering Mechanics (Static)		
Course Code	ME 1205		
Credit Hours	(		
Pre-requisite(s)	ME 1201 Calculus-I, ME 1202 Physics-I		
Co-requisite(s)	----------		
Semester	**Second**	**Year**	**2021-2022**
Instructors Name	Dr. Khaldoon F. Brethee		
Office Location	Room ME04– Mechanical Engineering Department.		
Tel. No.	07816664421		
Email	Khaldon77m@uoanbar.edu.iq		
Lecture Times	Sunday, Monday, 8:30-10:30		
Office Hours	Tuesday, Wednesday: 10:30-12:30		

Course Definition

This course produces an introduction to learn how to apply the principles of engineering to solve various applied mechanics problems. Concepts of mechanics will be applied in this course from previous courses you have taken in basic math and physics. The course addresses the modeling and analysis of static equilibrium problems with an emphasis on real world engineering applications and problem solving.

Course Description (as in the catalogue)

General Principles: Fundamental concepts, and units of measurement

Force vectors: Scalars and vectors, vector addition of forces, addition of a system of coplanar forces, Cartesian vectors, addition of Cartesian vectors, and Force vector

Equilibrium of a Particle: Condition for the equilibrium of a particle, the free-body diagram, coplanar force systems, and three-dimensional force systems.

Force System Resultants: Moment of a force (scalar formulation), moment of a force (vector

Formulation), moment of a force about a specified axis, and moment of a couple.

Equilibrium of a Rigid Body: Conditions for rigid-body equilibrium, support reactions.

Structure Analysis: Simple trusses, the method of joints, zero-force members, the method of sections, and frames and machines.

Friction: Characteristics of dry friction, problems involving dry friction, and frictional forces on flat belts.

Center of Gravity and Centroid: Center of Gravity, Center of Mass, and the Centroid of a Body

Moments of Inertia: Definition of moments of inertia for areas, and parallel-axis theorem for an area.

Course Learning Outcomes:

By the end of successful completion of this course, the student will be able to:

1. To understand the principles of mechanics to determine resultant forces of a system in rectangular or nonrectangular coordinates
2. To construct free-body diagrams and identify their appropriate equilibrium equations in terms of reaction forces in a frame structure and the connection forces in trusses.
3. An ability to analyse systems that include frictional forces.
4. An ability to locate centroid of an area and calculate second moments of inertia.

Alignment of Course Student Learning Outcomes to Program Student Learning Outcomes

CLOs		SOs (ABET) / NGOs (INAC)						
		1/i	2/ii	6/iii	3/iv	4/v	7/vi	5/vii
1. To understand the principles of mechanics to determine resultant forces of a system in rectangular or nonrectangular coordinates	Link	3						
	Assess	H,Q,E						
2. To construct free-body diagrams and identify their appropriate equilibrium equations in terms of reaction forces in a frame structure and the connection forces in	Link	3						
	Assess	H,Q,E						

CLOs		SOs (ABET) / NGOs (INAC)						
trusses.								
3. An ability to analyse systems that include frictional forces.	Link	1						
	Assess	H,Q,E						
4. An ability to locate centroid of an area and calculate second moments of inertia.	Link	1						
	Assess	H,Q,E						

Assessment Key- E: Exam, **H:** Homework, **Q:** Quiz, **P:** Project, **DP:** Design Project, **R:** Research, **T**: Teamwork, **PT**: Practical Training, **FW:** Field Work, **PR:** Presentation, **RE:** Report, **S:** Survey, **SE:** Seminar, **W:** Workshop, **C:** Conference, **O:** Other

Weekly Distribution of Course Topics/Contents

Week	Topic	Comments*	CLO
1.	Units, Force Systems & Resultant, Components of Force, Vectors	CH1	1
2.	Units, Force Systems & Resultant, Components of Force, Vectors	CH1	1
3.	Rectangular Components in Space	CH1	1
4.	Rectangular Components in Space	CH1	1
5.	Vector Products, Moment of forces, Rectangular Components of a Moment	CH2	1,2
6.	Rectangular Components of a Moment, Moment of a Couple, Couple Vectors	CH2	1,2
7.	Rectangular Components of a Moment, Moment of a Couple, Couple Vectors	CH2	1,2
8.	Rigid Bodies: Equivalent Systems: Resultants	CH3	2
9.	Rigid Bodies: Equivalent Systems: Resultants	CH3	2
10.	Analysis of Structure: Frames & Machines	CH4	2
11.	Analysis of Structure: Trusses	CH4	2
12.	Centroid and Centre of Area	CH5	4
13.	The 2nd Moment of Area	CH5	4
14.	Frictions: Dry Friction	CH6	3
15.	Frictions: Dry Friction	CH6	3
16.	**Final Exam**		

* In the comments, you can add the relevant chapter or notes, etc.

Scheduling of laboratory and other non-lecture sessions, including online sessions, as appropriate (if applicable)

Week	Topic	Comments	CLO

Information on out-of-class assignments with due dates for submission

Assignment/Activity	Due Date	Comments
HW	Week 3	
HW	Week 6	
HW	Week 8	
HW	Week 12	

Students' Assessment:

Students are assessed as follows:

Assessment Tool(s)**	Date	Weight (%)
Semester activities. These include quizzes, classroom interactions, attendance	Week-1-Week-15	15%
Homework	Week-3, 6, 8 &12	5%
Progressive Exams	Weeks-5, 9 &14	20%
Final Exam	Week-16	60%
Total		**100%**

** You can modify / add other tools relevant to the course.

Course Outcome Assessment Plan:

CLOs	Teaching/Learning Method(s)	Assessment Tool(s)	Threshold
To understand the principles of mechanics to determine resultant forces of a system in rectangular or nonrectangular coordinates	Lectures and tutorials	**E,H,Q**	50% pass
To construct free-body diagrams and identify their appropriate equilibrium equations in terms of reaction forces in a frame structure and the connection forces in trusses.	Lectures and tutorials	**E,H,Q**	50% pass
An ability to analyse systems that include frictional forces.	Lectures and tutorials	**E,H,Q**	50% pass
An ability to locate centroid of an area and calculate second moments of inertia.	Lectures and tutorials	**E,H,Q**	50% pass

Teaching and Learning Resources:

Text Book(s):

Hibbeler, R. C., & Fan, S. C. (1995). *Engineering mechanics: statics. SI edition*. Prentice Hall.

Recommended Readings:

Higdon, A., Stiles, W. B., & Davis, A. W. Engineering mechanics. Statics and dynamics, 1968.

Other Resources:

Attendance policy:

Attendance is compulsory. A student missing 3% of the total allocated course hours will receive 1st warning notice and a student missing 7% will receive 2nd warning notice. A student missing 10% will be forced to withdraw and considered failed for the current academic year (in accordance with the university regulations).

Plagiarism/Cheating:

Students are expected to do their own work. You are allowed to work on assignments in teams only if specified by the instructor. In other words, students are encouraged to communicate about general principles of the course, but all assigned homework must be done on an individual basis. The instructor is available to provide any assistance that you may need. Cheating is considered a serious offense by the university. You should be aware of the severe penalty for cheating.

Notes:

All lecture notes will be posted in the google classroom. Daily homework will be due at the beginning of the next class after it is assigned unless otherwise noted in class. All homework assignments should be turned in before class begins. Work will not be accepted beyond the due date. Written work must be done independently and must accurately represent the work of the student. All exams and quizzes are to be completed independently.

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COURSE SYLLABUS

COURSE TITLE

ENGINEERING NUMERICAL METHODS

Course Code

ME 3202

2nd Semester, 2021 / 2022

COURSE SYLLABUS

Course Title	Engineering NUMERICAL METHODS		
Course Code	ME 3202		
Credit Hours	3		
Pre-requisite(s)	ME1201 Calculus I, ME1202 Physics I, ME1205 Calculus II, ME1202 Physics II, ME2201 Calculus III, ME2202 Calculus IV.		
Co-requisite(s)			
Semester	2nd	**Year**	2021/2022
Instructors Name	Dr. Ghalib R. Ibrahim		
Office Location	ME Building, Room No. 4		
Tel. No.	07830985755		
Email	ghalib.ibrahim@uoanbar.edu.iq		
Lecture Times	Monday, 08:30am-10:30am Tuesday, 10:30am-11:30am		
Office Hours	Monday, 10:30am-12.30am		

Course Description (as in the catalogue)

The numerical methods course involves solving engineering problems drawn from all fields of engineering. The numerical methods include: error analysis, roots of nonlinear algebraic equations, solution of linear and transcendental simultaneous equations, matrix and vector manipulation, curve fitting and interpolation, numerical integration and differentiation, solution of ordinary and partial differential equations.

Course Objectives/Goals (optional)

Course Learning Outcomes:

By the end of successful completion of this course, the student will be able to:

1. To gain experience in error analysis.

2. Understanding the different numerical methods to solve systems of linear and nonlinear equations.
3. Understanding the different numerical methods for differentiation, integration, and solving a set of ordinary differential equations.
4. Understanding how numerical methods can be implemented in MATLAB software.

Alignment of Course Student Learning Outcomes to Program Student Learning Outcomes

CLOs		SOs (ABET) / NGOs (INAC)						
		1/i	2/ii	3/iv	4/v	5/vii	6/iii	7/vi
To gain experience in error analysis.	Link	4						
	Assess	H, Q, E						
Understanding the different numerical methods to solve systems of linear and nonlinear equations.	Link	4						
	Assess	H, Q, E						
Understanding the different numerical methods for differentiation, integration, and solving a set of ordinary differential equations.	Link	5						
	Assess	H, Q, E						
Understanding how numerical methods can be implemented in MATLAB software	Link	5						
	Assess	H, Q, E ,PT						

Assessment Key- **E:** Exam, **H:** Homework, **Q:** Quiz, **P:** Project, **DP:** Design Project, **R:** Research, **T**: Teamwork, **PT**: Practical Training, **FW:** Field Work, **PR:** Presentation, **RE:** Report, **S:** Survey, **SE:** Seminar, **W:** Workshop, **C:** Conference, **O:** Other

Weekly Distribution of Course Topics/Contents

Week	Topic	Comments*	Course CLO
1	Error Analysis		1
2	Error Analysis		1
3	Roots of equations		1
4	Roots of equations		2
5	Roots of equations		2
6	Solving system of linear equations		2
7	Solving system of linear equations		2

Week	Topic	Comments*	Course CLO
8	Integration and differentiation		3
9	Integration and differentiation		3
10	Integration and differentiation		3
11	Integration and differentiation		3
12	Ordinary differential equations		4
13	Ordinary differential equations		4
14	Ordinary differential equations		4
15	Ordinary differential equations		4
	Final Exam		

* In the comments, you can add the relevant chapter or notes, etc.

Scheduling of laboratory and other non-lecture sessions, including online sessions, as appropriate (if applicable)

Week	Topic	Comments	CLO

Information on out-of-class assignments with due dates for submission

Assignment/Activity	Due Date	Comments
HW	Week 3	
HW	Week 6	
HW	Week 9	
HW	Week 12	

Students' Assessment:

Students are assessed as follows:

Assessment Tool(s)**	Date	Weight (%)
Exams		24
Quizzes		10
Homework		6
Lab		10
Final Exam		50
Total		

** You can modify / add other tools relevant to the course.

Course Outcome Assessment Plan:

CLOs	Teaching/Learning Method(s)	Assessment Tool(s)	Threshold
To gain experience in error analysis.	Lectures and tutorials	**E,H,Q**	50% pass
Understanding the different numerical methods to solve systems of linear and nonlinear equations.	Lectures and tutorials	**E,H,Q**	50% pass
Understanding the different numerical methods for differentiation, integration, and solving a set of ordinary differential equations.	Lectures and tutorials	**E,H,Q**	50% pass
Understanding how numerical methods can be implemented in MATLAB software	Lectures and tutorials	**E,H,Q**	50% pass

Teaching and Learning Resources:

Text Book(s):

1. Numerical Methods for Engineers, S. C. Chapra and R. P Canale, McGraw-Hill, 6th edition 2010.

Recommended Readings:

Other Resources:

Attendance policy:

Attendance is compulsory. A student missing 3% of the total allocated course hours will receive 1st warning notice and a student missing 7% will receive 2nd warning notice. A student missing 10% will be forced to withdraw and considered failed for the current academic year (in accordance with the university regulations).

Plagiarism/Cheating:

Students are expected to do their own work. You are allowed to work on assignments in teams only if specified by the instructor. In other words, students are encouraged to communicate about general principles of the course, but all assigned homework must be done on an individual basis. The instructor is available to provide any assistance that you may need. Cheating is considered a serious offense by the university. You should be aware of the severe penalty for cheating.

Notes:

All lecture notes will be posted in the google classroom. Daily homework will be due at the beginning of the next class after it is assigned unless otherwise noted in class. All homework assignments should be turned in before class begins. Work will not be accepted beyond the due date. Written work must be done independently and must accurately represent the work of the student. All exams and quizzes are to be completed independently.

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Mechanical Engineering Department

COURSE SYLLABUS

Course Title

THERMODYNAMICS II
Course Code: ME 2307

2nd Semester, 2021 / 2022

COURSE SYLLABUS

Course Title	**Thermodynamics II**		
Course Code	ME 2307		
Credit Hours	3		
Pre-requisite(s)	ME 2201 Calculus III, ME 2303 Thermodynamics I		
Co-requisite(s)	ME 2202 Calculus IV		
Semester	2	Year	2021/2022
Instructors Name	Asst. Prof. Dr. Saad Mohammed Jalil		
Office Location	Mechanical Engineering Department – ME110		
Tel. No.	07800842666		
Email	saad.jalil@uoanbar.edu.iq		
Lecture Times	Monday: 08:30–09:30, Thu; 08:30–10:30		
Office Hours	Sunday (08:30-02:30), Monday (10:30–02:30), Thursday (10:30–02:30)		

Course Description (as in the Handbook):

Thermodynamics considers an important branch of physics that defines and studies the relationships between heat energy and other forms of energy, which is part of most practical applications that serve mankind. This course introduces the principles and applications of the Second Law of Thermodynamics. It concentrates on: understanding the thermal losses in relation to practical applications; steam and two-phase change systems, ideal gas and processes; using available sources of data such as thermodynamic tables and charts; application and operation of heat engine and heat pump cycles.

Course Objectives/Goals (optional):

This course is an introductory course in Thermodynamics at the undergraduate level. After successfully completing this course, students will understand how to deal essentially with the fundamentals principles of Thermodynamics including thermodynamic systems and properties, relationships between the thermal and physical properties, the various cooling and heating processes in both expansion and compression conditions, the Second Law of Thermodynamics and applications of this law in various single and two-phase cycles. Comprehend how to describe the useful systems depending on their performance. Also, students will be able to apply the principles of Thermodynamics to various fluid and heat transfer problems with some alternative solutions.

Course Learning Outcomes (CLO):

By the end of successful completion of this course, the student will be able to:

1. **Understand the basic concepts and principles of the Second Law of Thermodynamics.**
2. **To identify and formulate the entropy for single-phase (ideal gas) and two-phase(vapor) working substances.**
3. **Analyze and comprehend the single-phase (Air Cycles) with its reversible and irreversible processes.**
4. **Analyze and comprehend the two-phase (Steam Cycles) with its reversible and irreversible processes.**

Alignment of Course Student Learning Outcomes to Program Student Learning Outcomes

CLOs		SOs (ABET) / NGOs (INAC)						
		1/i	2/ii	6/iii	3/iv	4/v	7/vi	5/vii
Understand the basic concepts and principles of the Second Law of Thermodynamics.	Link	5		5				
	Assess	E, Q, H		RE				
To identify and formulate the entropy for single-phase (ideal gas) and two-phase(vapor) working substances.	Link	5		5				
	Assess	E, Q, H		RE				
Analyze and comprehend the single-phase (Air Cycles) with its reversible and irreversible processes.	Link	5		5				
	Assess	E, Q, H		RE				
Analyze and comprehend the two-phase (Steam Cycles) with its reversible and irreversible processes.	Link	5		5				
	Assess	E, Q, H		RE				

Assessment Key- E: Exam, **H:** Homework, **Q:** Quiz, **P:** Project, **DP:** Design Project, **R:** Research, **T**: Teamwork, **PT**: Practical Training, **FW:** Field Work, **PR:** Presentation, **RE:** Report, **S:** Survey, **SE:** Seminar, **W:** Workshop, **C:** Conference, **O:** Other

Weekly Distribution of Course Topics/Contents

Week	Topic	Comments*	CLO
1	The Second Law of Thermodynamics		1
2	Heat Engine and Its Types		1
3	Refrigerators & Heat Pumps		1
4	Entropy		1,2
5	Entropy Of Single Phase (Ideal Gas)		1,2
6	Entropy Of Tow Phase (Vapor)		1,2
7	Heat Engine Cycles		1,3
8	Carnot & Otto Cycles		1,3
9	Brayton & Diesel Cycles		1,3
10	Dual Cycle and Mean Effective Pressure		1,3
11	Steam Cycles (Carnot & Rankine Cycles)		1,4
12	Superheated & Reheated Rankine Cycles		1,4
13	Refrigeration System		1,4
14	Carnot Cycle		1,4
15	Refrigeration Cycles		1,4
	Final Exam		

* In the comments, you can add the relevant chapter or notes, etc.

Scheduling of laboratory and other non-lecture sessions, including online sessions, as appropriate (if applicable)

Week	Topic	Comments	Course CLO
1	Mechanical Heat Pump.		1,2
2	Mechanical Heat Pump.		1,2
3	Mechanical Heat Pump.		1,2
4	Mechanical Heat Pump.		1,2
5	Steam and Boiling		1,4
6	Steam and Boiling		1,4
7	Steam and Boiling		1,4
8	Steam and Boiling		1,4
9	Measurement of dryness fraction of steam.		1,4
10	Measurement of dryness fraction of steam.		1,4
11	Measurement of dryness fraction of steam.		1,4
12	Measurement of dryness fraction of steam.		1,4
13			
14			
15			

Information on out-of-class assignments with due dates for submission

Assignment/Activity	Due Date	Comments
HW	Week 3	**CH1**
HW	Week 6	**CH2**
HW	Week 9	**CH2**
HW	Week 12	**CH3**

Students' Assessment:

Students are assessed as follows:

Assessment Tool(s)**	Date	Weight (%)
Exams		16
Quizzes		12
Homework's		12
Lab		10
Final Exam		50
Total		**100**

** You can modify / add other tools relevant to the course.

Course Outcome Assessment Plan:

CLOs	Teaching/Learning Method(s)	Assessment Tool(s)	Threshold
Understand the basic concepts and principles of the Second Law of Thermodynamics.	Lectures, pictures and animation, tutorial, teamwork	**E,H,Q**	50% pass
Derive, analyze and discuss the forms of energy, and perform the First Laws of Thermodynamics for closed and open systems.	Lectures, pictures and animation, tutorial, teamwork	**E,H,Q**	50% pass
To identify and formulate the entropy for single-phase (ideal gas) and two-phase(vapor) working substances.	Lectures, pictures and animation, tutorial, teamwork	**E,H,Q**	50% pass
Perform and understand the two-phase problem (liquid-vapor) and analyze its processes.	Lectures, pictures and animation, tutorial, teamwork	**E,H,Q**	50% pass

Teaching and Learning Resources:

Text Book(s):
YUNUS A. CENGEL and MICHAEL A. BOLES" Thermodynamics an Engineering Approach".

Recommended Readings:
1. SONNTAG, BORGNAKKE and VAN WYLEN" Fundamental of Thermodynamics".
2. MERLE C. POTTER and CRAIG W. SOMERTON "Engineering thermodynamics".
3. T.D. ESTOP – A. MCCNKEY "Applied Thermodynamics".
4. RAYNER JOEL "Basic Engineering Thermodynamics".

Other Resources:
Online resources

Attendance policy:

Attendance is compulsory. A student missing 4% of the total allocated course hours will receive 1st warning notice, a student missing 6% will receive 2nd warning notice, and will receive 3rd warning notice as final warning notice. A student missing 10% will be forced to withdraw and considered failed for the current academic year in this course (in accordance with the university regulations).

Plagiarism/Cheating:

Students are expected to do their own work. You are allowed to work on assignments in teams only if specified by the instructor. In other words, students are encouraged to communicate about general principles of the course, but all assigned homework must be done on an individual basis. The instructor is available to provide any assistance that you may need. Cheating is considered a serious offense by the university. You should be aware of the severe penalty for cheating.

Notes:

All lecture notes will be uploaded to the department website and continuously posted in the course google classroom. Daily homework will be due at the beginning of the next class after it is assigned unless otherwise noted in class. All homework assignments should be turned in before class begins. Work will not be accepted beyond the due date. Written work must be done independently and must accurately represent the work of the student. All exams and quizzes are to be completed independently.

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COURSE SYLLABUS

Ethics and Leadership skills
ME 3102

2nd Semester, 2021 / 2022

COURSE SYLLABUS

Course Title	Ethics and Leadership skills		
Course Code	ME 3102		
Credit Hours	(2-2-0-0)		
Pre-requisite(s)	None		
Co-requisite(s)			
Semester	2	**Year**	2022
Instructors Name	Dr. sattar abed mutlag		
Office Location	Department of mechanical engineering .ME-01		
Tel. No.	07812818819		
Email	Satmutt1961@yahoo.com		
Lecture Times	Thursday 8:30 to 10:30		
Office Hours	Monday 8:30 to 11		

Course Description (as in the catalogue):

This course is designed to give the student the required skills in Administration and leadership that he needs in his career life.

Course Objectives/Goals (optional):

The goals of this course are to enable students to:

1-Develop an awareness of ethical challenges in your everyday lives and work.

2-Develop an awareness of ethical leadership/decision-making through research, interviews, observations in the real world, reading the text, and planning a symposium as a team.

Course Learning Outcomes:

By the end of successful completion of this course, the student will be able to:

1. To Learning Required Skills for Communications and Administration

2.To understanding of required of Ethics and Leadership skills

3. To Dealing with working by Ethics of markets and Commerce

Alignment of Course Student Learning Outcomes to Program Student Learning Outcomes

CLOs		SOs (ABET) / NGOs (INAC)						
		1/i	2/ii	6/iii	3/iv	4/v	7/vi	5/vii
1- To Learning Required Skills for Communications and Administration	Link					4	1	2
	Assess					E,H,Q	H,Q	H,Q
2- To understanding of required of Ethics and Leadership skills	Link					5	2	3
	Assess					E,H,Q	E,H,Q	E,H,Q
3- To Dealing with working by Ethics of markets and Commerce	Link					4	1	2
	Assess					E,H,Q	H,Q	E,H,Q
	Link							
	Assess							

Assessment Key- E: Exam, **H:** Homework, **Q:** Quiz, **P:** Project, **DP:** Design Project, **R:** Research, **T**: Teamwork, **PT**: Practical Training, **FW:** Field Work, **PR:** Presentation, **RE:** Report, **S:** Survey, **SE:** Seminar, **W:** Workshop, **C:** Conference, **O:** Other

Weekly Distribution of Course Topics/Contents

Week	Topic	Comments*	Course SLO
1.	Introduction to Leadership ,skills , and Characteristics		1
2.	Communication Skills		**1**
3.	Self-Administration		**2**
4.	Leadership of Life.		**1.2**
5.	Administration Skills		**3**
6.	Leadership Skills.		**1**
7.	Exam		2
8.	Introduction to Thinking Skills		**3**
9.	Thinking and Smart Skills.		**2,1**
10.	Education Development		**2**
11.	Skills of Working Market .		**2,3**
12.	Skills of Working Commerce		**2**
13.	Marketing of Searches, Services and Ideas.		**2,1**
14.	Making of Leaders		**3**
15.	Leaders of Changing		**3**
16.	**Final Exam**		1,2,3

* In the comments, you can add the relevant chapter or notes, etc.

Scheduling of laboratory and other non-lecture sessions, including online sessions, as appropriate (if applicable)

Week	Topic	Comments

Information on out-of-class assignments with due dates for submission

Assignment/Activity	Due Date	Comments

Students' Assessment:

Students are assessed as follows:

Assessment Tool(s)**	Date	Weight (%)
Exams		24
Quizzes		10
Homework's		4
Report		2
Final Exam		60
Total		100

** You can modify / add other tools relevant to the course.

Course Outcome Assessment Plan:

Course SLOs	Teaching/Learning Method(s)	Assessment Tool(s)	Performance Indicators
1. Learning Required Skills for Communications and Administration.	Lectures and tutorials	H, Q, E	50% pass
2.understanding of required Skills for Leadership.	Lectures and tutorials	H, Q, E	50% pass
2.understanding of required of Ethics and Leadership skills.	Lectures and tutorials	H, Q, E	50% pass

Teaching and Learning Resources:
By Topics
Text Book(s):

Recommended Readings:

Other Resources:

Attendance policy:

Attendance is compulsory. A student missing 3% of the total allocated course hours will receive 1st warning notice and a student missing 7% will receive 2nd warning notice. A student missing 10% will be forced to withdraw and considered failed for the current academic year (in accordance with the university regulations).

Plagiarism/Cheating:

Students are expected to do their own work. You are allowed to work on assignments in teams only if specified by the instructor. In other words, students are encouraged to communicate about general principles of the course, but all assigned homework must be done on an individual basis. The instructor is available to provide any assistance that you may need. Cheating is considered a serious offense by the university. You should be aware of the severe penalty for cheating.

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COURSE SYLLABUS

COURSE TITLE
Finite Element Method
Course Code: ME 4303E

2st Semester, 2021 / 2022

COURSE SYLLABUS

Course Title	Finite Element Method		
Course Code	ME 4303E		
Credit Hours	2		
Pre-requisite(s)	ME 2306 - Strength of materials-II, ME 3307 - Heat Transfer-II, ME2305 - Fluid Mechanics-II		
Co-requisite(s)			
Semester	2	Year	2021/2022
Instructors Name	Hamad M. Hasan, PhD		
Office Location			
Tel. No.	07735943588		
Email	Hamad.m.hasan@uoanbar.edu.iq		
Lecture Times	10:30 AM-12:30 AM, S and T		
Office Hours	8:30 AM-10:00 AM and 12:30 PM-1:30 PM, S and T		

Course Description (as in the catalogue):

Introduce the basic fundamentals of the finite element methods. Beginning with simple one-dimensional problem, continuing to two- and three-dimensional elements, and ending with some applications in heat transfer, solid mechanics and fluid mechanics. Covers modeling, mathematical formulation, and computer implementation.

Course Objectives/Goals (optional):

The goals of this course are to enable students to:

1. The students should understand the mathematical and physical principles underlying the FEA.
2. To provide students with basic skills of FEA programming using Matlab.

3. The formulation of finite element methods for linear static analysis of solids and structures.

Course Learning Outcomes:

1. Understand the basic finite element formulation techniques.
2. Be able to derive equations in finite element methods for 1D and 2D problems.
3. Be able to formulate and solve basic problems in heat transfer, solid mechanics and fluid mechanics.
4. Be able to write computer program based on finite element methods.

Alignment of Course Student Learning Outcomes to Program Student Learning Outcomes

CLOs		SOs (ABET) / NGOs (INAC)						
		1/i	2/ii	6/iii	3/iv	4/v	7/vi	5/vii
Understand the basic finite element formulation techniques	Link	5	4					
	Assess	E,H,Q	E,H,Q					
Be able to derive equations in finite element methods for 1D and 2D problems	Link	5	4					
	Assess	E,H,Q	E,H,Q					
Be able to formulate and solve basic problems in heat transfer, solid mechanics and fluid mechanics	Link	4	2					
	Assess	E,H,Q	E,H,Q					
Be able to write computer program based on finite element methods	Link	4	2					
	Assess	E,H,Q	E,H,Q					

Assessment Key- E: Exam, **H:** Homework, **Q:** Quiz, **P:** Project, **DP:** Design Project, **R:** Research, **T**: Teamwork, **PT**: Practical Training, **FW:** Field Work, **PR:** Presentation, **RE:** Report, **S:** Survey, **SE:** Seminar, **W:** Workshop, **C:** Conference, **O:** Other

Weekly Distribution of Course Topics/Contents

Week	Topic	Comments*	CLO
1.	Introduction		**1**
2.	Bar Element		**1**
3.	Beam Element		**1**
4.	Linear static analysis		**1**
5.	Two-Dimensional Analysis		**1**
6.	Finite element for two-dimensional problems		**1**
7.	Development of Truss Equations		**1**
8.	Development of Frame and Grid Equations		**2**
9.	Development of the Plane Stress and Plane Strain Stiffness Equations		**2**
10.	Isoperimetric Formulation		**3**
11.	Numerical Quadrature, Three-Dimensional Stress Analysis		**3**
12.	Finite Element Modeling and Solution Techniques		**3**
13.	Plate Elements		**4**
14.	Solid Elements for 3-D Elements		**4**
15.	Thermal Analysis		**4**
16.	**Final Exam**		

* In the comments, you can add the relevant chapter or notes, etc.

Scheduling of laboratory and other non-lecture sessions, including online sessions, as appropriate (if applicable)

Week	Topic	Comments	CLO

Information on out-of-class assignments with due dates for submission

Assignment/Activity	Due Date	Comments
HW	Week 4	
HW	Week 7	
HW	Week 9	
HW	Week 12	
HW	Week 14	

Students' Assessment:

Students are assessed as follows:

Assessment Tool(s)**	Date	Weight (%)
Exams		24
Quizzes		10
Homework's + Attendance		6
Lab		0
Final Exam		60
Total		

** You can modify / add other tools relevant to the course.

Course Outcome Assessment Plan:

CLOs	Teaching/Learning Method(s)	Assessment Tool(s)	Threshold
Understand the basic finite element formulation techniques.	Lectures and tutorials	**E,H,Q**	50% pass
Be able to derive equations in finite element methods for 1D and 2D problems.	Lectures and tutorials	**E,H,Q**	50% pass
Be able to formulate and solve basic problems in heat transfer, solid mechanics and fluid mechanics	Lectures and tutorials	**E,H,Q**	50% pass
Be able to write computer program based on finite element methods	Lectures and tutorials	**E,H,Q**	50% pass

Teaching and Learning Resources:

Text Book(s):

Olek C Zienkiewicz, Robert L Taylor, J.Z. Zhu, *The Finite Element Method: Its Basis and Fundamentals*, Sixth Edition, Butterworth-Heinemann 2005

Recommended Readings:

Other Resources:

Attendance policy:

Attendance is compulsory. A student missing 3% of the total allocated course hours will receive 1st warning notice and a student missing 7% will receive 2nd warning notice. A student missing 10% will be forced to withdraw and considered failed for the current academic year (in accordance with the university regulations).

Plagiarism/Cheating:

Students are expected to do their own work. You are allowed to work on assignments in teams only if specified by the instructor. In other words, students are encouraged to communicate about general principles of the course, but all assigned homework must be done on an individual basis. The instructor is available to provide any assistance that you may need. Cheating is considered a serious offense by the university. You should be aware of the severe penalty for cheating.

Notes:

All lecture notes will be posted in the google classroom. Daily homework will be due at the beginning of the next class after it is assigned unless otherwise noted in class. All homework assignments should be turned in before class begins. Work will not be accepted beyond the due date. Written work must be done independently and must accurately represent the work of the student. All exams and quizzes are to be completed independently.

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COURSE SYLLABUS

COURSE TITLE

Fluid Mechanics II

Course Code: ME 2305

2nd Semester, 2021 / 2022

COURSE SYLLABUS

Course Title	Fluid Mechanics II		
Course Code	ME 2305		
Credit Hours	3		
Pre-requisite(s)	ME1201 ME 1205, ME 1202, ME 1301, ME 2301		
Co-requisite(s)			
Semester	2	Year	2021/2022
Instructors Name	Professor Waleed M. Abed, PhD		
Office Location	Mechanical Engineering Department/ Ground floor, Room No.1		
Tel. No.	07832656477		
Email	waleed_eng76@uoanbar.edu.iq		
Lecture Times	Sunday's, 8:30 am-10:30 am, and 12:30 pm-2:30 pm Monday's, 8:30 am-9:30 am, and 9:30 am-10.30 am, and Lab 10:30 am-2.30 pm		
Office Hours	Sunday's, 10:30 am-12:30 am Tuesday's, 8:30 am-2:30 am		

Course Description (as in the catalogue):

This course covers basic criteria of the concept of a fluid, the fluid as a Continuum, Dimensions and Units. Dimensional analysis: dimensions, dimensional homogeneity, methods of dimensional analysis-Buckingham Pi theorem. Reynolds number regimes, Laminar and turbulent flow characteristics, laminar flow through circular and non- circular pipes, pipe flow friction factor (Darcy-Weisbach equation). Flow in Noncircular Ducts, Minor Losses in Pipe Systems, Multiple-Pipe Systems. Minor Losses, Piping Networks and Pump Selection, Piping Systems with Pumps and Turbines. Flow Rate and Velocity Measurement, Pitot and Pitot-Static Probes, Obstruction Flowmeters: Orifice, Venturi, and Nozzle Meters. Drag and Lift, Friction and Pressure Drag, Reducing Drag by Streamlining, Flow Separation. Drag Coefficients of Vehicles, Superposition, Parallel Flow over Flat Plates, Friction

Coefficient, Flow over Cylinders and Spheres, Effect of Surface Roughness, Lift. Introduction and Classification, the Centrifugal Pump, Pump Performance Curves and Similarity Rule, Mixed- and Axial-Flow Pumps: The Specific Speed, Matching Pumps to System Characteristics, Turbines.

Course Objectives/Goals (optional):

The goals of this course are to enable students to:

1) Perform and understand the viscous laminar and turbulent flow through pipes and ducts.
2) To understand major (friction) and minor losses of flow in piping system.
3) Match pump and turbine characteristics and system characteristics to determine the duty point.
4) To understand of flow rate and velocity measurements.
5) Select the type of pump or turbine on the basis of specific speed.

Course Learning Outcomes:

By the end of successful completion of this course, the student will be able to:

1. Perform and understand the viscous turbulent flow through pipes and ducts.
2. Employ Bernoulli's equation for real flow and deduce expressions for orifice meter and Venturi meter, and Pitot tube (flow rate and velocity measurements).
3. Characterize and analyze the pipe losses due to friction and minor losses in pipe systems as well as multiple-pipe systems.
4. Evaluate drag and lift force for a given set of dimension and variables.
5. Introduce and classify the centrifugal pump and pump performance curve.

Alignment of Course Student Learning Outcomes to Program Student Learning Outcomes

CLOs		SOs (ABET) / NGOs (INAC)						
		1/i	2/ii	6/iii	3/iv	4/v	7/vi	5/vii
Perform and understand the viscous laminar and turbulent flow through pipes and ducts.	Link	5		0				
	Assess	E,H,Q						
Employ Bernoulli's equation for real flow and deduce expressions for orifice meter and Venturi meter, and Pitot tube (flow rate and velocity measurements).	Link	5		4				
	Assess	E,H		RE				
Characterize and analyze the pipe losses due to friction and minor losses in pipe systems as well as multiple-pipe systems.	Link	4		4				
	Assess	E,H,Q		RE				
Evaluate drag and lift force for a given set of dimension and variables.	Link	4		0				
	Assess	E,H,Q						
Introduce and classify the centrifugal pump and pump performance curve.	Link	4		4				
	Assess	E,H		RE				

Assessment Key- E: Exam, **H:** Homework, **Q:** Quiz, **P:** Project, **DP:** Design Project, **R:** Research, **T**: Teamwork, **PT**: Practical Training, **FW:** Field Work, **PR:** Presentation, **RE:** Report, **S:** Survey, **SE:** Seminar, **W:** Workshop, **C:** Conference, **O:** Other

Weekly Distribution of Course Topics/Contents

Week	Topic	Comments*	CLO
1.	The concepts of dimensional analysis and similarity	Ch 1	1
2.	The Theorems of dimensional analysis and similarity	Ch 1	1
3.	Physical Modeling (Geometric, Kinematic and Dynamic Similarities)	Ch 1	1
4.	Laminar flow in pipes	Ch 2	2
5.	Turbulent flow in pipes	Ch 2	2
6.	The Moody chart	Ch 2	2
7.	Types of fluid flow problems	Ch 2	2
8.	Piping Networks with Pumps and Turbines	Ch 3	3
9.	The efficiency of the pump–motor combination	Ch 3	3
10.	Flow rate and velocity measurements	Ch 3	3
11.	Obstruction flowmeters: Orifice, Venturi, and Nozzle meters	Ch 3	3
12.	Flow over bodies: drag and lift	Ch 4	4

Week	Topic	Comments*	CLO
13.	Drag and lift coefficients of common geometries	**Ch 4**	**4**
14.	Turbomachinery-Pumps	**Ch 5**	**5**
15.	Pump Performance Curves and Matching a Pump to a Piping System	**Ch 5**	**5**
16.	**Final Exam**		

* In the comments, you can add the relevant chapter or notes, etc.

Scheduling of laboratory and other non-lecture sessions, including online sessions, as appropriate (if applicable)

Week	Topic	Comments	CLO
1, 2, 3, 4	Flow through Venturi Meter	Four groups	**2**
5, 6, 7, 8	Major losses (frictional energy losses) in pipes	Four groups	**3**
9, 10, 11, 12	Minor losses in pipe fittings	Four groups	**4**

Information on out-of-class assignments with due dates for submission

Assignment/Activity	Due Date	Comments
HW	Week 3	
HW	Week 6	
HW	Week 9	
HW	Week 11	
HW	Week 13	

Students' Assessment:

Students are assessed as follows:

Assessment Tool(s)**	Date	Weight (%)
Exams		24
Quizzes		10
Homework's		6
Lab		10
Final Exam		50
Total		

** You can modify / add other tools relevant to the course.

Course Outcome Assessment Plan:

CLOs	Teaching/Learning Method(s)	Assessment Tool(s)	Threshold
Perform and understand the viscous laminar and turbulent flow through pipes and ducts.	Lectures and tutorials	**E,H,Q**	50% pass
Employ Bernoulli's equation for real flow and deduce expressions for orifice meter and Venturi meter, and Pitot tube (flow rate and velocity measurements).	Lectures and tutorials	**E,H**	50% pass
Characterize and analyze the pipe losses due to friction and minor losses in pipe systems as well as multiple-pipe systems.	Lectures and tutorials	**E,H,Q**	50% pass
Evaluate drag and lift force for a given set of dimension and variables.	Lectures and tutorials	**E,H,Q**	50% pass
Introduce and classify the centrifugal pump and pump performance curve.	Lectures and tutorials	**E,H**	50% pass

Teaching and Learning Resources:

Text Book(s):
Frank M. White, "*Fluid Mechanics*", WCB McGraw-Hill series in mechanical engineering, Fourth Edition, 2012.

Recommended Readings:

Other Resources:
Yunus A. Çengel and John M. Cimbala, "*Fluid Mechanics: Fundamentals and Applications*", McGraw-Hill series in mechanical engineering, 1st Edition, 2006.

Bruce R. Munson, Donald F. Young, Theodore H. Okiishi, and Wade W.Huebsch, "*Fundamentals of Fluid Mechanics*", John Wiley & Sons, 6th Edition, 2009.

Victor L. Streeter, E. Benjamin Wylie, Keith W. Bedford, "*Fluid Mechanics*", McGraw-Hill, 9th Edition, 2002.

Attendance policy:

Attendance is compulsory. A student missing 3% of the total allocated course hours will receive 1st warning notice and a student missing 7% will receive 2nd warning notice. A student missing 10% will be forced to withdraw and considered failed for the current academic year (in accordance with the university regulations).

Plagiarism/Cheating:

Students are expected to do their own work. You are allowed to work on assignments in teams only if specified by the instructor. In other words, students are encouraged to communicate about general principles of the course, but all assigned homework must be done on an individual basis. The instructor is available to provide any assistance that you may

need. Cheating is considered a serious offense by the university. You should be aware of the severe penalty for cheating.

Notes:

All lecture notes will be posted in the google classroom. Daily homework will be due at the beginning of the next class after it is assigned unless otherwise noted in class. All homework assignments should be turned in before class begins. Work will not be accepted beyond the due date. Written work must be done independently and must accurately represent the work of the student. All exams and quizzes are to be completed independently.

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COURSE SYLLABUS

COURSE TITLE

Heat Transfer II

Course Code: ME 3307

2nd Semester, 2021 / 2022

COURSE SYLLABUS

Course Title	Heat Transfer II		
Course Code	ME 3307		
Credit Hours	3		
Pre-requisite(s)	Numerical Engineering Methods, Fluid Mechanics II, Thermodynamics II, Calculus IV, Heat Transfer I.		
Co-requisite(s)			
Semester	2	Year	2021/2022
Instructors Name	Hamdi E. Ahmed, PhD		
Office Location	Ground floor		
Tel. No.	07825242246		
Email	hamdi.ahmed@uoanbar.edu.iq		
Lecture Times	Sunday:10:30 - 12:30, Monday: 11:30-12:30		
Office Hours	Sunday: 8:30 AM-10:30 AM, Tuesday: 8:30 -10:30		

Course Description (as in the catalogue):

Heat Transfer/ II is a required module for mechanical engineering students. Convection heat transfer is studied in both internal and external geometries under laminar and turbulent flow regimes. Free convection is also considered where heat transfer is due to flow induced by fluid buoyancy. Heat Exchangers Types and the effective NTU relations are studied as well as Boiling and Condensation empirical correlations.

Course Objectives/Goals (optional):

1. Basic heat transfer mechanisms (Convection).
2. Laminar and turbulent flow regimes through internal and external geometries.
3. Heat Exchangers.

4. Boiling and Condensation heat transfer.

Course Learning Outcomes:

By the end of successful completion of this course, the student will be able to:

1. To understand the free and forced convection heat Transfer Mechanisms.
2. To recognize the internal and external convection heat transfer.
3. To distinguish the laminar and turbulent convection heat transfer of internal and external flows.
4. To Illustrate convection heat transfer from fins.
5. To Solve the combined free and forced (Mixed) convection heat transfer.

Alignment of Course Student Learning Outcomes to Program Student Learning Outcomes

CLOs		SOs (ABET) / NGOs (INAC)						
		1/i	2/ii	6/iii	3/iv	4/v	7/vi	5/vii
To understand the free and forced convection heat Transfer Mechanisms.	Link	1						
	Assess	Q						
To recognize the internal and external convection heat transfer.	Link	3	2	1				
	Assess	Q,E	H	RE				
To distinguish the laminar and turbulent convection heat transfer of internal and external flows.	Link	3		1				
	Assess	H,Q,E		RE				
To Illustrate convection heat transfer from fins.	Link	3	2	1				
	Assess	H,E	Q	RE				
To Solve the combined free and forced (Mixed) convection heat transfer.				1				
				RE				

Assessment Key- E: Exam, **H:** Homework, **Q:** Quiz, **P:** Project, **DP:** Design Project, **R:** Research, **T**: Teamwork, **PT**: Practical Training, **FW:** Field Work, **PR:** Presentation, **RE:** Report, **S:** Survey, **SE:** Seminar, **W:** Workshop, **C:** Conference, **O:** Other

Weekly Distribution of Course Topics/Contents

Week	Topic	Comments*	CLO
1.	Physical Mechanism of Convection	**Ch 1**	**1, 5**
2.	Classification of Fluid Flows	**Ch 1**	**1, 5**
3.	Thermal Boundary Layer	**Ch 1**	**1, 5**
4.	Hydraulic boundary layer	**Ch 1**	**1**
5.	External Forced Convection	**Ch 2**	**1**
6.	Parallel Flow over Flat Plates	**Ch 2**	**1**
7.	Flow across Cylinders and Spheres	**Ch 2**	**2**
8.	Flow across Tube Banks	**Ch 2**	**2**
9.	Internal Forced Convection	**Ch 3**	**3**
10.	Laminar Flow in Tubes	**Ch 3**	**3**
11.	The Entrance Region	**Ch 3**	**4**
12.	Turbulent Flow in Tubes	**Ch 3**	**4**
13.	Natural Convection from Finned Surfaces	**Ch 4**	**4**
14.	Natural Convection inside Enclosures	**Ch 4**	**4**
15.	Combined Natural and Forced Convection	**Ch 4**	**4**
16.	**Final Exam**		

* In the comments, you can add the relevant chapter or notes, etc.

Scheduling of laboratory and other non-lecture sessions, including online sessions, as appropriate (if applicable)

Week	Topic	Comments	CLO
2	Natural Convection Heat Transfer.		**1**
5	Forced Convection Heat Transfer		**1**
7	Double Pipe Heat Exchangers (effect of inlet fluid temperature).		**5**
10	Double Pipe Heat Exchangers (effect of cold fluid mass flowrate).		**2, 3**
13	Double Pipe Heat Exchangers (effect of cold fluid flow direction).		**4**

Information on out-of-class assignments with due dates for submission

Assignment/Activity	Due Date	Comments
H	Week 6	By google classroom
H	Week 13	By google classroom

Students' Assessment:

Students are assessed as follows:

Assessment Tool(s)**	Date	Weight (%)
H	Week 6, 13	6
Q	Week 5, 12	10
E	Week 9, 15	24
Lab (RE)	Week 1–15	10
Final Exam		50
Total		

** You can modify / add other tools relevant to the course.

Course Outcome Assessment Plan:

CLOs	Teaching/Learning Method(s)	Assessment Tool(s)	Threshold
To understand the free and forced convection heat Transfer Mechanisms.	Lectures and tutorials	H	50% pass
To recognize the internal and external convection heat transfer.	Lectures and tutorials	H, Q, E	50% pass
To distinguish the laminar and turbulent convection heat transfer of internal and external flows.	Lectures and tutorials	H, Q, E	50% pass
To Illustrate convection heat transfer from fins.	Lectures and tutorials	H, Q, E	50% pass
To Solve the combined free and forced (Mixed) convection heat transfer.	Lectures and tutorials	H, Q, E	50% pass

Teaching and Learning Resources:

Text Book(s):

1.Yunus A. Cengel, "Heat Transfer, A Practical Approach", 2nd Edition, 2012.

Recommended Readings:

1. J. P. Holman, "Heat Transfer", 9th Edition, 2013.

2. F. P. Incropera & D. P. Dewitt, "Fundamentals of Heat and Mass Transfer", 2011.

Other Resources:

Attendance policy:

Attendance is compulsory. A student missing 3% of the total allocated course hours will receive 1st warning notice and a student missing 7% will receive 2nd warning notice. A student missing 10% will be forced to withdraw and considered failed for the current academic year (in accordance with the university regulations).

Plagiarism/Cheating:

Students are expected to do their own work. You are allowed to work on assignments in teams only if specified by the instructor. In other words, students are encouraged to communicate about general principles of the course, but all assigned homework must be done on an individual basis. The instructor is available to provide any assistance that you may need. Cheating is considered a serious offense by the university. You should be aware of the severe penalty for cheating.

Notes:

All lecture notes will be posted in the google classroom. Daily homework will be due at the beginning of the next class after it is assigned unless otherwise noted in class. All homework assignments should be turned in before class begins. Work will not be accepted beyond the due date. Written work must be done independently and must accurately represent the work of the student. All exams and quizzes are to be completed independently.

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COURSE SYLLABUS

COURSE TITLE

INDUSTRIAL ENGINEERING & ECONOMIC ANALYSIS

Course Code

ME 3310

2nd Semester, 2021 / 2022

COURSE SYLLABUS

Course Title	Industrial Engineering & Economic Analysis		
Course Code	**ME 3310**		
Credit Hours	3		
Pre-requisite(s)	ME 1303 Principles of manufacturing process, and ME 3305 Manufacturing		
Co-requisite(s)	Operation researches, ME3102 Ethics & leadership skills		
Semester	2nd	**Year**	**2021 / 2022**
Instructors Name	Kadhum Ahmed Abed		
Office Location	ME 01		
Tel. No.	07832949085		
Email	Kadhum1968@uoanbar.edu.iq		
Lecture Times	Monday's, 12:30am-1:30am Tuesday's, 8:30am-10.30am		
Office Hours	Sunday's, 10:30-12:30		

Course Description (as in the catalogue):

This is a required course for the Mechanical Engineering Program**.** Production and services systems inputs and output, management concepts and history, Management systems role & functions of management. Factors affecting industrial development, industrial development of Iraq, organization structures & types. Productivity, basic concepts, classification, measurement and improvement. Role of work study, work measurement and work sampling. Plant location criteria, equipment and utilities layout, types of layout. Material handling systems. Types of production, group technology, variety control, make or buy decisions. Demand forecasting, useful forecasting models, material requirement planning, capacity requirement planning MRPII. Inventory models and Just in time (JIT) technique, production planning, scheduling problems & models, Industrial safety.

Course Objectives/Goals (optional):

The goals of this course are to enable students to:

1. Understand the theoretical workings of the organization structures & types, Productivity, basic concepts, classification, measurement and improvement.
2. Understand the relationship between a facility layout location criterion, equipment and utilities layout, types of layout and Material handling systems.
3. To determine the direct cost, underact cost, and Productivity.
4. Solve demand forecasting, , material requirement planning MRP, Bill of material (BOM)
5. Understand the applications of, Inventory models and Just in time (JIT) technique, production planning, scheduling problems & models.
6. Learn Industrial safety and application.

Course Learning Outcomes:

By the end of successful completion of this course, the student will be able to:

1. An ability to understand the theoretical workings of the organization structures & types, Productivity, basic concepts, classification, measurement and improvement.
2. An ability to planning of plant using the relationship between a Plant location criterion, equipment and utilities layout, types of layout and Material handling systems. Bill of material (BOM)
3. To gain experience and further mastery of complete problem solving fluency based on determine the fixed cost, variable cost, Productivity, forecasting, material requirement planning MRP.
4. An ability to applications of, Inventory models, Just in time (JIT) technique, ISO, production planning, scheduling problems & models.
5. Learn proper Industrial safety and application.

Alignment of Course Student Learning Outcomes to Program Student Learning Outcomes

CLOs		SOs (ABET) / NGOs (INAC)						
		1/i	2/ii	6/iii	3/iv	4/v	7/vi	5/vii
1- An ability to understand the theoretical workings of the organization structures & types, Productivity, basic concepts, classification, measurement and improvement.	Link		2			1	1	
	Assess		H,E			-	-	
2-An ability to planning of plant using the relationship between a Plant location criterion, equipment and utilities layout, types of layout and Material handling systems. Bill of material (BOM) and control tools.	Link		-			1	-	
	Assess		Q ,E			H	-	
3- To gain experience and further mastery of complete problem solving fluency based on determine the fixed cost, variable cost, Productivity, forecasting, material requirement planning MRP and quality control measurement.	Link		2			-	2	
	Assess		H				Q	
4- An ability to applications of, Inventory models, Just in time (JIT) technique, ISO, production planning, scheduling problems & models.	Link		3			1	-	
	Assess		E			H	-	
5- Learn proper Industrial safety and application.	Link						1	
	Assess						E	
	Link							
	Assess							

Assessment Key- **E:** Exam, **H:** Homework, **Q:** Quiz, **P:** Project, **DP:** Design Project, **R:** Research, **T**: Teamwork, **PT**: Practical Training, **FW:** Field Work, **PR:** Presentation, **RE:** Report, **S:** Survey, **SE:** Seminar, **W:** Workshop, **C:** Conference, **O:** Other

Weekly Distribution of Course Topics/Contents

Week	Topic	Comments*	CLO
1.	Process of organization design		1
2.	Product layout flow		1
3.	Product layout flow		1
4.	Systematic layout planning		1, 2
5.	Flow process charts		1,2
6.	Bill of material		2,3
7.	Exam		1,2
8.	Material handling		1, 5
9.	Human engineering		2, 5
10.	Quality control and Inspection		2
11.	Quality control and Inspection		2, 4
12.	Control chart for variables		1, 2
13.	Control chart for attributes		1, 2,
14.	Industrial safety.		2,4
15.	Final Exam		1, 2, 3, 4, 5
16.			

* In the comments, you can add the relevant chapter or notes, etc.

Scheduling of laboratory and other non-lecture sessions, including online sessions, as appropriate (if applicable)

Week	Topic	Comments	CLO

Information on out-of-class assignments with due dates for submission

Assignment/Activity	Due Date	Comments

Students' Assessment:

Students are assessed as follows:

Assessment Tool(s)**	Date	Weight (%)
Exams		24
Quizzes		10
Homework's		4
Report		2
Final Exam		60
Total		100

** You can modify / add other tools relevant to the course.

Course Outcome Assessment Plan:

CLOs	Teaching/Learning Method(s)	Assessment Tool(s)	Threshold
An ability to understand the theoretical workings of the organization structures & types, Productivity, basic concepts, classification, measurement and improvement.	Lectures and tutorials	**Q,E**	50% pass
An ability to planning of plant using the relationship between a Plant location criterion, equipment and utilities layout, types of layout and Material handling systems.	Lectures and tutorials	**Q,E**	50% pass
To gain experience and further mastery of complete problem solving fluency based on determine the fixed cost, variable cost, Productivity, forecasting, material requirement planning MRP,	Lectures and tutorials	**Q,E**	50% pass
An ability to applications of, Inventory models, Just in time (JIT) technique, ISO, production planning, scheduling problems & models.	Lectures	**Q,E**	50% pass
To learn proper Industrial safety and application.	Lectures	**Q,E**	50% pass

Teaching and Learning Resources:

Text Book(s):

1- Production & Operations Management by Evert E. Adam Jr and Ronald.

2- . Production Management by Kieth & Loekyer.

Recommended Readings:

1. **Analysis & Control of Production Systems by Elsayed & Boucher.**
2. **Engineering Economy by D. Garmo.**

Other Resources:

Attendance policy:

Attendance is compulsory. A student missing 3% of the total allocated course hours will receive 1st warning notice and a student missing 7% will receive 2nd warning notice. A student missing 10% will be forced to withdraw and considered failed for the current academic year (in accordance with the university regulations).

Plagiarism/Cheating:

Students are expected to do their own work. You are allowed to work on assignments in teams only if specified by the instructor. In other words, students are encouraged to communicate about general principles of the course, but all assigned homework must be done on an individual basis. The instructor is available to provide any assistance that you may need. Cheating is considered a serious offense by the university. You should be aware of the severe penalty for cheating.

Notes:

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COURSE SYLLABUS

REFRIGERATION

Course Code:ME4307

2nd (Fall) Semester, 2021/ 2022

COURSE SYLLABUS

Course Title	Refrigeration		
Course Code	ME 4307		
Credit Hours	3		
Pre-requisite(s)	ME 2307 Thermodynamics-II, ME 3307 Heat Transfer-II		
Co-requisite(s)	-		
Semester	2 (Fall)	Year	2021-2022
Instructors Name	Obaid Talak Fadhil, PhD		
Office Location	Mech. Eng. Building, Room No.ME009		
Tel. No.	+964790 459 3257		
Email	obaid.fadhil@uoanbar.edu.iq		
Lecture Times	Monday's, 8:30 am –10:30 am Wednsday's,10:30 am –11:30 am		
Office Hours	Sunday's,8:30 am – 1:00 pm Tuesday's, 8:30 am – 12:30 am		

Course Description (as in the catalogue):

History of refrigeration, applications of refrigeration, current status & future trends, units, thermodynamics, heat transfer, fluid mechanics, vapour compression cycle, refrigerator & heat pump, ideal vapour compression refrigeration cycle, practical vapour compression cycle, multi pressure vapour compression cycles, classification of refrigerants, desirable properties of refrigerants, common refrigerants, simple vapour absorption cycle, practical absorption systems, properties of refrigerants & absorbents, absorption cycle analysis, Bell-Coleman or reversed Brayton cycle, application of aircraft refrigeration, simple air cooling system, Boot-Strap air cooling system, regenerative air cooling system, thermoelectric refrigeration, vortex tube refrigeration, steam jet water vapour refrigerating system

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Course Objectives/Goals (optional):

The Objectives of this course are to enable students to:

1. Understand the parts of the vapour compression cycle, and how to analyze and solve the relevant exercises.

2. Have knowledge of the refrigerants, and the most important properties which must be available in them.

3. Familiarize the students on how the vapour absorption cycles operate, as well as the procedure to analyze and solve the relevant exercises.

4. Identify the types of air refrigeration cycles, and how to analyze and solve the relevant exercises.

5. Have knowledge of the thermoelectric, vortex tube, and steam jet water vapour refrigeration systems.

Course Learning Outcomes:

By the end of successful completion of this course, the student will be able to:

1. Analysis the performance of the vapour compression cycles and understand the most important properties which must be available in the refrigerants.
2. Estimate the performance parameters of the lithium bromide-water absorption refrigeration cycles for a certain cooling load.
3. Apply the laws of thermodynamics on the air refrigeration cycles.
4. Explain the components and the principle of work of the thermoelectric, vortex tube, and steam jet water vapour refrigeration systems.

Alignment of Course Student Learning Outcomes to Program **Student Learning Outcomes**

CLOs		SOs (ABET) / NGOs (INAC)						
		1/i	2/ii	6/iii	3/iv	4/v	7/vi	5/vii
1. . Analysis the performance of the vapour compression cycles and understand the most important properties which must be available in the refrigerants.	Link		**4**	**1**				
	Assess		H, Q, E	RE				
2. Estimate the performance parameters of the lithium bromide-water absorption refrigeration cycles for a certain cooling	Link		**3**					
	Assess		H, Q, E					

CLOs		SOs (ABET) / NGOs (INAC)						
load.applications.								
3. Apply the laws of thermodynamics on the air refrigeration cycles.	Link		**3**					
	Assess		H,Q,E					
4. Explain the components and the principle of work of the thermoelectric, vortex tube, and steam jet water vapour refrigeration systems.	Link		**2**	**2**				
	Assess		Q,E	Q,E,RE				

Assessment Key- **E:** Exam, **H:** Homework, **Q:** Quiz, **P:** Project, **DP:** Design Project, **R:** Research, **T**: Teamwork, **PT**: Practical Training, **FW:** Field Work, **PR:** Presentation, **RE:** Report, **S:** Survey, **SE:** Seminar, **W:** Workshop, **C:** Conference, **O:** Other

Weekly Distribution of Course Topics/Contents

Week	Topic	Comments*	Course CLO
1.	History of Refrigeration, Application of Refrigeration, Review of Basic Principles	**Ch1+Ch2**	**1**
2.	Vapour compression Cycles, Basic Cycle Theory, Ideal Vapour Compression Refrigeration Cycle	**Ch3**	**1**
3.	Practical Vapour Compression Refrigeration Cycle, Vapour Compression Cycle Calculation	**Ch3**	**1**
4.	Multi-pressure Vapour Compression Cycles, Multistage vapour Compression Cycles	**Ch3**	**1**
5.	Multi-evaporator Systems, Heat Pumps	**Ch3**	**1**
6.	Refrigerants, Classification, Desirable Properties of Refrigerants, Common Refrigerants	**Ch4**	**1**
7.	Vapour Absorption Cycle, Simple Vapour Absorption Cycle, Practical Absorption Systems	**Ch5**	**2**
8.	Properties of Refrigerants and Absorbents, Absorption Cycle Analysis	**Ch5**	**2**
9.	Operation of Absorption Cycles	**Ch5**	**2**
10.	Air Refrigeration Systems, Reversed Carnot Cycle, Bell-Colemann Cycle, Actual Bell-Colemann Cycle	**Ch6**	**3**
11.	Methods of Air Refrigeration Systems, Simple Air-cooling System, Simple Air Evaporative Cooling System	**Ch6**	**3**
12.	Boot-strap Air Cooling System, Regenerative Air Cooling System	**Ch6**	**3**
13.	Other Refrigeration Cycles, Thermoelectric Refrigeration	**Ch7**	**4**
14.	Vortex tube Refrigeration	**Ch7**	**4**
15.	Steam Jet water Vapour Refrigeration System	**Ch7**	**4**
16.	**Final Exam**		

* In the comments, you can add the relevant chapter or notes, etc.

Scheduling of laboratory and other non-lecture sessions, including online sessions, as appropriate (if applicable)

Week	Topic	Comments
1,2,3	Illustrative refrigeration unit.	
4,5,6	Mechanical heat pump.	
7,8,9	Diagnosis of faults in vapour compression systems.	
10,11,12	Electrolix refrigerator.	
13,14,15	Thermo-electric refrigeration.	

Information on out-of-class assignments with due dates for submission

Assignment/Activity	Due Date	Comments
HW	Week 3	Ch3
HW	Week 6	Ch3
HW	Week 9	Ch5
HW	Week 12	Ch6

Students' Assessment:

Students are assessed as follows:

Assessment Tool(s)**	Date	Weight (%)
Exams		18
Quizzes		12
Homework's		10
Lab.		10
Final Exam		50
Total		**100**

** You can modify / add other tools relevant to the course.

Course Outcome Assessment Plan:

Course SLOs	Teaching/Learning Method(s)	Assessment Tool(s)	Performance Indicators
1	Lectures, tutorials and lab.	E, H, Q, RE	50% pass
2	Lectures and tutorials	E, H, Q	50% pass
3	Lectures, tutorials and lab.	E, H, Q	50% pass
4	Lectures and tutorials	Q, E, RE	50% pass

E: Exam, **H:** Homework, **Q:** Quiz, **P:** Project, **DP:** Design Project, **R:** Research, **T**: Teamwork, **PT**: Practical Training, **FW:** Field Work, **PR:** Presentation, **RE:** Report, **S:** Survey, **SE:** Seminar, **W:** Workshop, **C:** Conference, **O:** Other

Teaching and Learning Resources:

Text Book(s):

Refrigeration and air conditioning by *Ahmadul Ameen***,** *Prentice-Hall of India, New Delhi, 2007.*

Refrigeration and Air Conditioning by S.N.Sapali.

Recommended Readings:

Refrigeration and air conditioning by C.P.Arora.

Other Resources:

Laboratory experiments

Attendance policy:

Attendance is compulsory. A student missing 3% of the total allocated course hours will receive 1st warning notice and a student missing 7% will receive 2nd warning notice. A student missing 10% will be forced to withdraw and considered failed for the current academic year (in accordance with the university regulations).

Plagiarism/Cheating:

Students are expected to do their own work. You are allowed to work on assignments in teams only if specified by the instructor. In other words, students are encouraged to communicate about general principles of the course, but all assigned homework must be done on an individual basis. The instructor is available to provide any assistance that you may need. Cheating is considered a serious offense by the university. You should be aware of the severe penalty for cheating.

Notes:

Daily homework will be due at the beginning of the next class after it is assigned unless otherwise noted in class. All homework assignments should be turned in before class begins. Work turned in late will be penalized in increments of 10% per day. Work will not be accepted beyond two days late without special coordination affected prior to the due date. Students in this course with disability requiring an accommodation should contact the professor as soon as possible or contact the head of the department.

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COURSE SYLLABUS

COURSE TITLE
Engineering of Metallurgy
Course Code: ME 2304

2st Semester, 2021 / 2022

COURSE SYLLABUS

Course Title	**Engineering of Metallurgy**		
Course Code	**ME 2304**		
Credit Hours	5		
Pre-requisite(s)	**ME 1301**		
Co-requisite(s)			
Semester	2	Year	2021/2022
Instructors Name	Rashaq Abdullah Mohammed Msc		
Office Location			
Tel. No.	07904560245		
Email	rashaqabdullah@uoanbar.edu.iq		
Lecture Times	10:30 AM-12:30 AM, S and 8:30AM-10:30AM W		
Office Hours	8:30 AM-11:30 AM M and 8:30 PM-1:30 PM, T		

Course Description (as in the catalogue):

Structure of Metals: Crystalline structure of metals Grains and grain boundaries, Nucleation and dendritic growth, Influence of solidification conditions on structure and properties. Defection cast metals

Course Objectives

1. To provide an understanding of the crystalline structure of metals.
2. Knowing the Iron/ Carbon phase diagram and the effect of rapid cooling,
3. To know what is the Thermal Equilibrium Diagrams?
4. To know the Heat Treatment processes, stress relieving, Annealing, full annealing, incomplete annealing, Isothermal annealing, diffusing annealing (homogenizing) annealing of casting, spherioidosing.

Course Learning Outcomes

After successful completion of this course, the students will be able to:

1. explain the basic concepts of metallurgy.
2. Understand of the crystalline structure, and relate chemical composition, structure and properties of metallic materials.
3. Adjust the structure and properties of metallic materials according to their applications.
4. Describe and understand Thermal Equilibrium Diagrams, Iron/ Carbon phase diagram and Heat Treatment processes

Alignment of Course Student Learning Outcomes to Program Student Learning Outcomes

CLOs		SOs (ABET) / NGOs (INAC)						
		1/i	2/ii	6/iii	3/iv	4/v	7/vi	5/vii
explain the basic concepts of metallurgy	Link	2		3				
	Assess	Q,E		Q,E				
Understand of the crystalline structure, and relate chemical composition, structure and properties of metallic materials..	Link	2		3				
	Assess	Q,E		Q,E				
3. Adjust the structure and properties of metallic materials according to their applications.	Link	3		4				
	Assess	Q,E		Q,E				
4. Describe and understand Thermal Equilibrium Diagrams, Iron/ Carbon phase diagram and Heat Treatment processes	Link	3		4				
	Assess	Q,E,H		Q,E,H				

CLOs		SOs (ABET) / NGOs (INAC)						
	Link							
	Assess							
	Link							
	Assess							

Assessment Key- E: Exam, **H:** Homework, **Q:** Quiz, **P:** Project, **DP:** Design Project, **R:** Research, **T**: Teamwork, **PT**: Practical Training, **FW:** Field Work, **PR:** Presentation, **RE:** Report, **S:** Survey, **SE:** Seminar, **W:** Workshop, **C:** Conference, **O:** Other

Weekly Distribution of Course Topics/Contents

Week	Topic	Comments*	CLO
1.	crystal structure	**Ch 1**	**1**
2.	DENSITY COMPUTATIONS and	**Ch 1**	**1,2**
3.	Crystallographic Points, Directions, and Planes	**Ch 1**	**1,2**
4.	Alloying and SOLIDIFICATION OF METALS	**Ch 2**	**1,2,3,4**
5.	Alloying and SOLIDIFICATION OF METALS	**Ch 2**	**1,2,3,4**
6.	Alloying and SOLIDIFICATION OF METALS	**Ch 2**	**1,2,3,4**
7.	The Iron–Carbon System	**Ch 3**	**1,2,3,4**
8.	The Iron–Carbon System	**Ch 3**	**1,2,3,4**
9.	The Iron–Carbon System	**Ch 3**	**1,2,3,4**
10.	The Iron–Carbon System	**Ch 3**	**1,2,3,4**
11.	Cast Iron	**Ch 4**	**1,2,3,4**
12.	Cast Iron	**Ch 4**	**1,2,3,4**
13.	Heat Treatment	**Ch 5**	**1,2,3,4**
14.	Heat Treatment	**Ch 5**	**1,2,3,4**
15.	Heat Treatment	**Ch 5**	**1,2,3,4**
16.	**Final Exam**		

* In the comments, you can add the relevant chapter or notes, etc.

Scheduling of laboratory and other non-lecture sessions, including online sessions, as appropriate (if applicable)

Week	Topic	Comments	CLO
1	**Learn the correct steps to prepare a sample for microscopy**		**1**

2	**Learn the correct steps to prepare a sample for microscopy**		**1**
3	**Learn the correct steps to prepare a sample for microscopy**		**1**
4	**Learn the correct steps to prepare a sample for microscopy**		**1**
5	**Learn the correct steps to check the hardness of metals**		**1,2**
6	**Learn the correct steps to check the hardness of metals**		**1,2**
7	**Learn the correct steps to check the hardness of metals**		**1,2**
8	**Studying the effect of increasing the percentage of carbon on the mechanical properties and microstructure of steel**		**1,2,3,4**
9	**Studying the effect of increasing the percentage of carbon on the mechanical properties and microstructure of steel**		**1,2,3,4**
10	**Studying the effect of increasing the percentage of carbon on the mechanical properties and microstructure of steel**		**1,2,3,4**
11	**Studying the effect of increasing the percentage of carbon on the mechanical properties and microstructure of steel**		**1,2,3,4**
12	**Studying the effect of increasing the percentage of carbon on the mechanical properties and microstructure of steel**		**1,2,3,4**
13	**Studying the effect of increasing the percentage of carbon on the mechanical properties and microstructure of steel**		**1,2,3,4**
14	**Studying the effect of heat treatments on the mechanical properties and microstructure of steel**		**1,2,3,4**
15	**Studying the effect of heat treatments on the mechanical properties and microstructure of steel**		**1,2,3,4**

Information on out-of-class assignments with due dates for submission

Assignment/Activity	Due Date	Comments

Q	Week 3	
Q	Week 4	
Q	Week 5	
HW	Week 6	
E	Week 7	
Q	Week 8	
Q	Week 9	
Q	Week 10	
HW	Week 11	
E	Week 13	
Q	Week 14	
Q	Week 15	

Students' Assessment:

Students are assessed as follows:

Assessment Tool(s)**	Date	Weight (%)
Exams		20
Quizzes		10
Homework's		10
Lab		10
Final Exam		50
Total		**100**

** You can modify / add other tools relevant to the course.

Course Outcome Assessment Plan:

CLOs	Teaching/Learning Method(s)	Assessment Tool(s)	Threshold
explain the basic concepts of metallurgy	Lectures and tutorials	**E,H,Q, p**	50% pass
Design shafts for static and variable stresses and estimate stress concentration.	Lectures and tutorials	**E,H,Q, p**	50% pass
Understand of the crystalline structure, and relate chemical composition, structure and properties of metallic materials..	Lectures and tutorials	**E,H,Q, p**	50% pass
Design of welding, bonding and other permanent joints	Lectures and tutorials	**E,H,Q,**	50% pass

Teaching and Learning Resources:

Text Book(s):

1- Materials Science and Engineering An Introduction by William D. Callister, Jr..

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Recommended Readings:

1. The metallurgy: structure, properties and heat treatment by D. J. D. and L. A. O.
2. Materials and Processes in Manufacturing by E.P Degarmo

Attendance policy:

Attendance is compulsory. A student missing 3% of the total allocated course hours will receive 1st warning notice and a student missing 7% will receive 2nd warning notice. A student missing 10% will be forced to withdraw and considered failed for the current academic year (in accordance with the university regulations).

Plagiarism/Cheating:

Students are expected to do their own work. You are allowed to work on assignments in teams only if specified by the instructor. In other words, students are encouraged to communicate about general principles of the course, but all assigned homework must be done on an individual basis. The instructor is available to provide any assistance that you may need. Cheating is considered a serious offense by the university. You should be aware of the severe penalty for cheating.

Notes:

All lecture notes will be posted in the google classroom. Daily homework will be due at the beginning of the next class after it is assigned unless otherwise noted in class. All homework assignments should be turned in before class begins. Work will not be accepted beyond the due date. Written work must be done independently and must accurately represent the work of the student. All exams and quizzes are to be completed independently.