Republic of Iraq - Ministry of Higher Education and Scientific Research

Basrah of University

Bachelor's degree in Mechanical Engineering (First cycle)

Four years (Eight semesters) - 240 ECTS credits - 1 ECTS = 25 hr

Program Curriculum (2023 - 2024)

جمهورية العراق - وزارة التعليم العالي والبحث العلمي

جامعة البصرة

بكالوريوس في الهندسة الميكانيكية (الدورة الأولى)

أربع سنوات (ثمانية فصول دراسية) - ٢٤٠ وحدة اوربية - كل وحدة اوربية = ٢٥ ساعة

المنهاج الدراسي للعام ٢٠٢٣-٢٠٢٤

Level	Semester	No.	Module Code	Module Name in English	اسم المادة الدراسية	Language	SSWL (hr/w)						Exam hr/sem	SSWL	USSWL	SWL	ECTS	Module Type	Prerequisite Module(s) Code
							CL (hr/w)	Lect (hr/w)	Lab (hr/w)	Pr (hr/w)	Tut (hr/w)	Semn (hr/w)		hr/sem	hr/sem	hr/sem			
UGI	One	1	BEM111	Mathematics I	رياضيات ا	English	4				1		2	77	48	125	5.00	B	
		2	BEM112	Engineering Mechanics-Static	ميكانيك هندسي-سكوني	English	5				1		2	92	58	150	6.00	C	
		3	BEM113	Engineering Drawing I	رسم هندسي ا	English	2			3			2	77	48	125	5.00	S	
		4	BEM114	Applied Science	علوم تطبيقية	English	6						2	92	58	150	6.00	S	
		5	BEM115	Computer Programming	برمجة حاسبات	English	4		2				2	92	58	150	6.00	S	
		6	BEM116	Human Rights and Democracy	ديمقراطية وحقوق انسان	Arabic	2						2	32	18	50	2.00	B	
						Total	23	0	2	3	2	0	12	462	288	750	30.00		

Level	Semester	No.	Module Code	Module Name in English	اسم المادة الدراسية	Language	SSWL (hr/w)						Exam hr/sem	SSWL	USSWL	SWL	ECTS	Module Type	Prerequisite Module(s) Code
							CL (hr/w)	Lect (hr/w)	Lab (hr/w)	Pr (hr/w)	Tut (hr/w)	Semn (hr/w)		hr/sem	hr/sem	hr/sem			
	Two	1	BEM121	Mathematics II	رياضيات II	English	4				1		2	77	48	125	5.00	B	
		2	BEM122	Engineering Mechanics-Dynamic	ميكانيك هندسي-حركي	English	4				1		2	77	48	125	5.00	C	
		3	BEM123	Engineering Drawing II	رسم هندسي II	English	1			3			2	62	38	100	4.00	S	
		4	BEM124	Electrical Engineering	هندسة كهربائية	English	3		3				2	92	58	150	6.00	S	
		5	BEM125	Production Engineering	هندسة انتاج	English	4		3		1		2	122	78	200	8.00	C	
		6	BEM126	Academic English Language	لغة انكليزية اكاديمية	English	2						2	32	18	50	2.00	B	
						Total	18	0	6	3	3	0	12	462	288	750	30.00		

Level	Semester	No.	Module Code	Module Name in English	اسم المادة الدراسية	Language	SSWL (hr/w)						Exam hr/sem	SSWL	USSWL	SWL	ECTS	Module Type	Prerequisite Module(s) Code
							CL (hr/w)	Lect (hr/w)	Lab (hr/w)	Pr (hr/w)	Tut (hr/w)	Semn (hr/w)		hr/sem	hr/sem	hr/sem			
UGII	Three	1	BEM211	Engineering Mathematics I	رياضيات هندسية ا	English	4						2	62	38	100	4.00	S	
		2	BEM212	Fluid Mechamics	ميكانيك موائع	English	5		3		1		2	137	88	225	9.00	C	
		3	BEM213	Strength of Materials	مقاومة مواد	English	5		3		1		2	137	88	225	9.00	C	
		4	BEM214	Advanced Computer Programming	برمجة حاسبات متقدمة	English	4		2				2	92	58	150	6.00	S	
		5	BEM215	Crimes of Uprooted Baath Party	جرائم حزب البعث المنحل	Arabic	2						2	32	18	50	2.00	B	
														0		0	0.00		
						Total	20	0	8	0	2	0	10	460	290	750	30.00		

Level	Semester	No.	Module Code	Module Name in English	اسم المادة الدراسية	Language	SSWL (hr/w)						Exam hr/sem	SSWL	USSWL	SWL	ECTS	Module Type	Prerequisite Module(s) Code
							CL (hr/w)	Lect (hr/w)	Lab (hr/w)	Pr (hr/w)	Tut (hr/w)	Semn (hr/w)		hr/sem	hr/sem	hr/sem			
	Four	1	BEM221	Engineering Mathematics II	رياضيات هندسية II	English	4						2	62	38	100	4.00	S	
		2	BEM222	Thermodynamics	ديناميك حرارة	English	4		3		1		2	122	78	200	8.00	C	
		3	BEM223	Engineering Metallurgy	هندسة معادن	English	4		3				2	107	68	175	7.00	C	
		4	BEM224	Mechanical Drawing	رسم ميكانيكي	English	1			3			2	62	38	100	4.00	C	
		5	BEM225	Electrical Machines	مكائن كهربائية	English	4		3				2	107	68	175	7.00	S	
														0		0	0.00		
						Total	17	0	9	3	1	0	10	460	290	750	30.00		

Level	Semester	No.	Module Code	Module Name in English	اسم المادة الدراسية	Language	SSWL (hr/w)						Exam hr/sem	SSWL	USSWL	SWL	ECTS	Module Type	Prerequisite Module(s) Code
							CL (hr/w)	Lect (hr/w)	Lab (hr/w)	Pr (hr/w)	Tut (hr/w)	Semn (hr/w)		hr/sem	hr/sem	hr/sem			
		1	BEM311	Engineering Analysis	تحليلات هندسية	English	4				1		2	77	48	125	5.00	S	

	Five	2	BEM312	Gas Dynamics & Turbomachines	ديناميك الغازات	English	4		3		1		2	122	78	200	8.00	C	
		3	BEM313	Manufacturing Processes	عمليات تصنيع	English	5		3		1		2	137	88	225	9.00	C	
		4	BEM314	Internal Combustion Engines	محركات احتراق داخلي	English	4		3		1		2	122	78	200	8.00	C	
														0		0	0.00		
														0		0	0.00		
						Total	17	0	9	0	4	0	8	458	292	750	30.00		

UGIII	Semester	No.	Module Code	Module Name in English	اسم المادة الدراسية	Language	SSWL (hr/w)						Exam hr/sem	SSWL	USSWL	SWL	ECTS	Module Type	Prerequisite Module(s) Code
							CL (hr/w)	Lect (hr/w)	Lab (hr/w)	Pr (hr/w)	Tut (hr/w)	Semn (hr/w)		hr/sem	hr/sem	hr/sem			
	Six	1	BEM321	Numerical Analysis	تحليلات عددية	English	3		2		1		2	92	58	150	6.00	S	
		2	BEM322	Heat Transfer	انتقال حرارة	English	5		3		1		2	137	88	225	9.00	C	
		3	BEM323	Theory of Machines	نظرية الالات	English	4		3		1		2	122	78	200	8.00	C	
		4	BEM324	Design of Machine Elements I	تصميم اجزاء المكائن I	English	3		3		1		2	107	68	175	7.00	C	
														0		0	0.00		
														0		0	0.00		
						Total	15	0	11	0	4	0	8	458	292	750	30.00		

Level	Semester	No.	Module Code	Module Name in English	اسم المادة الدراسية	Language	SSWL (hr/w)						Exam hr/sem	SSWL	USSWL	SWL	ECTS	Module Type	Prerequisite Module(s) Code
							CL (hr/w)	Lect (hr/w)	Lab (hr/w)	Pr (hr/w)	Tut (hr/w)	Semn (hr/w)		hr/sem	hr/sem	hr/sem			
UGIV	Seven	1	BEM411	Design of Machine Elements II	تصميم اجزاء المكائن II	English	3				1		2	62	38	100	4.00	C	
		2	BEM412	Engineering Materials	مواد هندسية	English	4						2	62	38	100	4.00	C	
		3	BEM413	Power Plants	محطات قدرة	English	4		3		1		2	122	78	200	8.00	C	
		4	BEM414	Control & Measurements	قياسات وسيطرة	English	5		3		1		2	137	88	225	9.00	C	
		5	BEM415	Engineering Project	مشروع هندسي	English	2			3			2	77	48	125	5.00	C	
						Total	18	0	6	3	3	0	10	460	290	750	30.0		

UGIV	Semester	No.	Module Code	Module Name in English	اسم المادة الدراسية	Language	SSWL (hr/w)						Exam hr/sem	SSWL	USSWL	SWL	ECTS	Module Type	Prerequisite Module(s) Code
							CL (hr/w)	Lect (hr/w)	Lab (hr/w)	Pr (hr/w)	Tut (hr/w)	Semn (hr/w)		hr/sem	hr/sem	hr/sem			
	Eight	1	BEM421	Renewable Energy	طاقة متجددة	English	3				1		2	62	38	100	4.00	C	
		2	BEM422	Industrial Engineering and Management	هندسة صناعية و ادارة مشاريع	English	4				1		2	77	48	125	5.00	S	
		3	BEM423	Air Conditioning and Refrigeration	تكييف الهواء والتثليج	English	5	3			1		2	137	63	200	8.00	C	
		4	BEM424	Theory of Vibrations	نظرية اهتزازات	English	4	3			1		2	122	78	200	8.00	C	
		5	BEM425	Engineering Project (continued)	مشروع هندسي (مستمر)	English	2			3			2	77	48	125	5.00	C	
						Total	18	6	0	3	4	0	10	475	275	750	30.0		
						Total	146	6	51	15	23	0	80	3695	2305	6000	240.0		Must be 240 ECTS

Note: The student should complete 4 weeks of Summer Internships to fullfil the requirements of the Bachelor's degree

Structured SWL (hr/w) type		
	CL	Class Lecture
	Lab	Laboratory
	Pr	Practical Training
	Tut	Tutorial
	Lect	Online lecture
	Semn	Seminar

Module type		
	B	Basic learning activities
	C	Core learning activity
	S	Suport or related learning activity
	E	Elective learning activity

SWL:	Student Workload
SSWL:	Structured SWL
USSWL:	Unstructured SWL

Note: Columns O, Q and R are progrmaed, protected and should not be edited

Program Catalogue **2023 - 2024** **دليل البرنامج الدراسي**

University of Basrah
College of Engineering

جامعة البصرة
كلية الهندسة

First Cycle-Bachelor′s Degree (B.Sc.)\ Mechanical Engineering بكالوريوس هندسة ميكانيكية

Table of Contents

1. Mission & Vision Statement

Vision Statement

The mechanical engineering department's vision is to graduate mechanical engineers who agree with the newest universal international curriculum, and consequently execute different engineering projects which the country needs now. Provide mechanical engineering assignation with the best context of engineering, educational and researchable to build and service their countr

Mission Statement

The mechanical engineering department adopts an equable studios program that has various theoretical lectures and practical aspects. Further, the department is keen to develop the laboratories in the best way to integrate the applied aspects with theoretical subjects which provides the students with a better understanding and uptake of the engineering subjects deeply. The department has a clear view of scientific research that adapts practical aspects to service the development in Iraq. Saving the adequate medium to create the best collegiate life for the students, which can be done by a harmonious and unitary educational process in the university and saving the finest possibility of students on path formation of students efforts to communion and contribution in students work across all its fields. This is besides the development of a wide range of platforms as well as high quality of employments and actuate the students over authorship and innovation. Consequently, attainment Iraqi society and the southern region requirements for mechanical engineers who have the best quality in education and scientific research as well as society service.

2. Program Specification

Program code:	BSc-Mechanical Engineering	**ECTS**	240
Duration:	4 levels, 8 Semesters	**Method Attendance:**	Full Time

Mechanical engineering science is a wonderfully wide-ranging subject. The focus of the program is on everything related to the mechanical engineering, whether it is the power or applied mechanics. The degree is popular or some it is the breadth of the subject that appeals, for others it is a path to specialization. All students have the opportunity to transfer onto our specialist degrees in the mechanical engineering at the end of the first year.

Level 1 exposes students to the fundamentals of the mechanical engineering, suitable for progression to all programs within the mechanical engineering program group. Program specific core topics are covered at Level 2 preparing for research-led subject specialist modules at Levels 3 and 4. A Leeds mechanical engineering graduate is therefore trained to appreciate how research informs teaching, according to the university mission statements.

At Levels 2, 3 and 4 students are free to choose more than half of their module credits with the proviso a range of modules are selected that reflect the complexity of the mechanical engineering to ensure the breadth of knowledge expected of a graduate with the mechanical engineering degree. This allows students to develop their own wide-ranging interests in the mechanical engineering. Decisions on what to study are made with input from personal tutors.

The research ethos is developed and fostered from the start via practical's, which are either embedded in lecture modules or taught in dedicated practical modules, research seminars and tutorials. There is a compulsory field course in Level 1, which students must pass in order to progress into Level 2, and optional field courses in Levels 2, 3 and 4. At Level 4 all students carry out an independent research project, which deals with theoretical or experimental studies in the fields of power or applied mechanics under supervision of professional supervisory teams.

Academic tutorials are held at all levels with tutors who provide continuity and progressive guidance. All levels include a number of workshops to teach skills, e.g. use of library and presentation skills, followed by assessed exercises, e.g. essays and talks, as opportunities to practice these skills in a subject-specific context.

3. Program Goals

Mechanical engineering program is designed to prepare students for successful careers having positive societal impact in industry, academic fields, and scientific consulting. Program educational objectives are as follows:

1. A combination of mathematics and basic sciences general education component (some with experimental experience) appropriate to the discipline.
2. Mechanical Engineering topics, consisting of mechanical engineering sciences and engineering design appropriate to the mechanical utilization study.
3. A general education component that complements the technical content of the curriculum and is consistent with the program and institution objectives.

4. Student Learning Outcomes

These student learning outcomes in Mechanical Engineering ensure that graduates are well-prepared to contribute to the design, development, and operation of mechanical systems in diverse industries such as automotive, aerospace, energy, manufacturing, and robotics.

1. Technical Competence: Mechanical Engineering students will develop a strong foundation in core engineering principles and acquire technical expertise in areas such as thermodynamics, mechanics, materials science, and control systems. They will demonstrate proficiency in applying this knowledge to solve complex engineering problems.

2. Design and Innovation: Students will gain the skills to design and innovate mechanical systems and components. They will be able to analyze requirements, develop conceptual designs, and apply engineering principles to create efficient, reliable, and sustainable solutions.
3. Experimental and Analytical Skills: Mechanical Engineering students will develop the ability to conduct experiments, analyze data, and draw meaningful conclusions. They will utilize laboratory equipment and computational tools to evaluate the performance of mechanical systems and validate design solutions.
4. Teamwork and Communication: Students will work effectively in multidisciplinary teams, demonstrating collaboration, leadership, and effective communication skills. They will be able to contribute constructively to group projects, present technical information clearly, and collaborate with professionals from diverse backgrounds.
5. Professional Ethics and Responsibility: Mechanical Engineering graduates will understand the ethical and professional responsibilities associated with their profession. They will adhere to high standards of integrity, demonstrate awareness of environmental and societal impacts, and prioritize safety and sustainability in their engineering practices.
6. Lifelong Learning and Adaptability: Students will develop a mindset of continuous learning and adaptability to evolving technologies and industry trends. They will engage in professional development activities, stay updated with advancements in the field, and possess the skills to adapt to new challenges and technologies throughout their careers.

5. Academic Staff

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6. Credits, Grading and GPA

Credits

University of Basrah follows the Bologna Process with the European Credit Transfer System (ECTS). The total degree program number of ECTS is 240, 30 ECTS per semester. 1 ECTS is equivalent to 25 hrs student workload, including structured and unstructured workload.

Grading

Before the evaluation, the results are divided into two subgroups: pass and fail. Therefore, the results are independent of the students who failed a course. The grading system is defined as follows:

GRADING SCHEME مخطط الدرجات				
Group	**Grade**	التقدير	**Marks (%)**	**Definition**
Success Group (50 - 100)	**A** - Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX** - Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F - Fail	راسب	(0-44)	Considerable amount of work required
Note:				
Number Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.				

Calculation of the Cumulative Grade Point Average (CGPA)

The CGPA is calculated by the summation of each module score multiplied by its ECTS, all are divided by the program total ECTS.

CGPA of a 4-year B.Sc. degree:

CGPA = [(1st module score x ECTS) + (2nd module score x ECTS) + ……] / 240

7. Curriculum/ Modules

Semester 1 | 30 ECTS | 1 ECTS = 25 hrs

Code	Module	SSWL	USSWL	ECTS	Type	Pre-request
BEM111	Mathematics I	77	48	5.00	B	
BEM112	Engineering Mechanics-Static	92	58	6.00	C	
BEM113	Engineering Drawing I	62	48	5.00	S	
BEM114	Applied Science	92	58	6.00	S	
BEM115	Computer Programming	92	58	6.00	S	
BEM116	Human Rights and Democracy	32	18	2.00	B	

Semester 2 | 30 ECTS | 1 ECTS = 25 hrs

Code	Module	SSWL	USSWL	ECTS	Type	Pre-request
BEM121	Mathematics II	77	48	5.00	B	
BEM122	Engineering Mechanics-Dynamic	77	48	5.00	C	
BEM123	Engineering Drawing II	62	38	4.00	S	
BEM124	Electrical Engineering	92	58	6.00	S	
BEM125	Production Engineering	122	78	8.00	C	
BEM126	Academic English Language	32	18	2.00	B	

Semester 3 | 30 ECTS | 1 ECTS = 25 hrs

Code	Module	SSWL	USSWL	ECTS	Type	Pre-request
BEM211	Engineering Mathematics I	62	38	4.00	S	
BEM212	Fluid Mechanics	137	88	9.00	C	
BEM213	Strength of Materials	137	88	9.00	C	
BEM214	Advanced Computer Programming	92	58	6.00	S	
BEM215	The Crimes of Uprooted Baath Party	32	18	2.00	B	

Semester 4 | 30 ECTS | 1 ECTS = 25 hrs

Code	Module	SSWL	USSWL	ECTS	Type	Pre-request
BEM221	Engineering Mathematics II	62	38	4.00	S	
BEM222	Thermodynamics	122	78	8.00	C	
BEM223	Engineering Metallurgy	107	68	7.00	C	
BEM224	Mechanical Drawing	62	38	4.00	C	
BEM225	Electrical Machines	107	68	7.00	S	

Semester 5 | 30 ECTS | 1 ECTS = 25 hrs

Code	Module	SSWL	USSWL	ECTS	Type	Pre-request
BEM311	Engineering Analysis	77	48	5.00	S	
BEM312	Gas Dynamics & Turbomachines	122	78	8.00	C	
BEM313	Manufacturing Processes	137	88	9.00	C	
BEM314	Internal Combustion Engines	122	78	8.00	C	

Semester 6 | 30 ECTS | 1 ECTS = 25 hrs

Code	Module	SSWL	USSWL	ECTS	Type	Pre-request
BEM321	Numerical Analysis	92	58	6.00	S	
BEM322	Heat Transfer	137	88	9.00	C	
BEM323	Theory of Machines	122	78	8.00	C	
BEM324	Design of Machine Elements I	107	68	7.00	C	

Semester 7 | 30 ECTS | 1 ECTS = 25 hrs

Code	Module	SSWL	USSWL	ECTS	Type	Pre-request
BEM411	Design of Machine Elements II	62	38	4.00	C	
BEM412	Engineering Materials	62	38	4.00	C	
BEM413	Power Plants	122	78	8.00	C	
BEM414	Control & Measurements	137	88	9.00	C	
BEM415	Engineering Project	77	48	5.00	C	

Semester 8 | 30 ECTS | 1 ECTS = 25 hrs

Code	Module	SSWL	USSWL	ECTS	Type	Pre-request
BEM421	Renewable Energy	62	38	4.00	C	
BEM422	Project Managment	77	48	5.00	S	
BEM423	Air Conditioning and Refrigeration	137	63	8.00	C	
BEM424	Theory of Vibrations	122	78	8.00	C	
BEM425	Engineering Project (continued	77	48	5.00	C	

8. Contact

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Modules Catalogue **2023 - 2024** **دليل المواد الدراسية**

University of Basrah
College of Engineering

جامعة البصرة
كلية الهندسة

First Cycle-Bachelor′s Degree (B.Sc.)\ Mechanical Engineering

بكالوريوس هندسة ميكانيكية

Table of Contents

1. Overview

This catalogue is about the courses (modules) given by the program of Mechanical Engineering to gain the Bachelor of Science degree. The program delivers (39) Modules with (6000) total student workload hours and 240 total ECTS. The module delivery is based on the Bologna Process.

نظره عامه

يتناول هذا الدليل المواد الدراسية التي يقدمها برنامج الهندسة الكهربائية للحصول على درجة بكالوريوس العلوم. يقدم البرنامج (39) مادة دراسية، على سبيل المثال، مع (٦٠٠٠) إجمالي ساعات حمل الطالب و ٢٤٠ إجمالي وحدات أوروبية. يعتمد تقديم المواد الدراسية على عملية بولونيا.

2. Undergraduate Modules 2023 – 2024

Module 1

Code	Course/Module Title	ECTS	Semester
BEM111	Mathematics I	5	1
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
4	1	77	48
Description			
Mathematics I is an introductory course designed to provide students with a solid foundation in fundamental mathematical concepts and skills. This course covers topics such as algebra, geometry, and basic calculus. Students will develop their problem-solving abilities and logical reasoning skills through a variety of mathematical exercises and applications. The course aims to foster critical thinking and mathematical literacy, enabling students to understand and apply mathematical principles in real-world scenarios. Mathematics I serve as a building block for advanced mathematical courses and provides students with the necessary tools to analyze and solve mathematical problems effectively. Through this course, students will develop a strong mathematical foundation that can be applied across various disciplines.			

Module 2

Code	Course/Module Title	ECTS	Semester
BEM112	Engineering Mechanics-Static	6	1
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
5	1	92	58
Description			
Engineering Mechanics - Statics is a core course in engineering that explores the behavior of stationary bodies under the influence of forces. It provides students with a solid foundation in understanding and analyzing the equilibrium of structures and mechanical systems. Through this course, students learn how to calculate and resolve forces, moments, and couples acting on particles and rigid bodies. Topics covered include the principles of static equilibrium, the analysis of trusses and frames, the concept of free body diagrams, and the study of distributed forces. By mastering Engineering Mechanics - Statics, students develop essential skills in problem-solving, critical thinking, and spatial reasoning. This course serves as a crucial building block for various engineering disciplines, including civil, mechanical, aerospace, and structural engineering, as it provides the fundamental knowledge necessary for the design and analysis of static structures and mechanical systems.			

Module 3

Code	Course/Module Title	ECTS	Semester
BEM113	Engineering Drawing I	5	1
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	3	77	48
Description			
Engineering Drawing I is an introductory course that focuses on developing the essential skills required for technical drawing and communication in engineering. Through this course, students learn the principles of creating accurate and precise drawings using industry-standard drafting techniques. Topics covered include orthographic projection, isometric drawings, dimensioning, sectioning, and basic geometric constructions. Students gain proficiency in interpreting and creating engineering drawings, including mechanical components, assembly drawings, and architectural plans. Engineering Drawing I plays a vital role in engineering design and serves as a universal language for engineers, enabling them to communicate their ideas effectively and precisely. By mastering this course, students develop the skills necessary for visualizing and conveying engineering concepts and become proficient in creating accurate technical drawings to industry standards.			

Module 4

Code	Course/Module Title	ECTS	Semester
BEM114	Applied Science	6	1
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
6	-	92	58
Description			
Applied Science, encompassing the disciplines of physics and chemistry, is an integral part of various fields of study, including engineering, materials science, and biotechnology. In the realm of physics, students explore the fundamental principles governing the behavior of matter and energy, such as mechanics, thermodynamics, electricity, and optics. They gain an understanding of how these principles apply to real-world phenomena and practical applications. In chemistry, students delve into the composition, structure, properties, and transformations of matter. They learn about chemical reactions, bonding, equilibrium, and the principles underlying various analytical techniques. Applied science courses provide students with a strong foundation in scientific principles, laboratory techniques, data analysis, and problem-solving skills. By studying physics and chemistry, students acquire the knowledge necessary to analyze and interpret natural phenomena, develop innovative technologies, and contribute to advancements in fields such as energy, materials, healthcare, and environmental science.			

Module 5

Code	Course/Module Title	ECTS	Semester
BEM115	Computer Programming	6	1
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
4	2	92	58
Description			
Computer Programming is a fundamental skill that empowers individuals to create, manipulate, and automate processes using computer code. Through the study of programming languages, students gain the ability to design, develop, and implement software solutions to a wide range of problems. They learn programming concepts such as variables, control structures, loops, functions, and data structures. Additionally, students explore algorithmic thinking and problem-solving methodologies to tackle complex programming challenges. Computer Programming equips students with the skills to write code, debug programs, and test software applications. It fosters logical reasoning, critical thinking, and attention to detail. This field is vital in various industries, including software development, web development, data science, artificial intelligence, and automation. By mastering Computer Programming, students become proficient in turning ideas into functional and efficient programs, contributing to technological innovation and shaping the digital world we live in.			

Module 6

Code	Course/Module Title	ECTS	Semester
BEM116	Human Rights and Democracy	2	1
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	-	32	18

Description

Human rights and democracy are two interconnected concepts that play a significant role in shaping the political and social landscape of modern societies. Here's a description of each:
Human Rights:Human rights are fundamental rights and freedoms that are inherent to all individuals, regardless of their nationality, ethnicity, gender, religion, or other characteristics. They are considered universal, inalienable, and indivisible. Human rights encompass a wide range of principles and protections, including:
Civil and Political Rights: These rights pertain to individual freedom and participation in the political process. Examples include the right to life, liberty, and security; the right to free expression, assembly, and association; and the right to participate in free and fair elections.
Economic, Social, and Cultural Rights: These rights focus on people's well-being and standard of living. They encompass the right to education, healthcare, housing, and decent working conditions, among others.
Universal Rights: These rights, such as the right to be free from torture, discrimination, and slavery, are considered non-negotiable and apply to all individuals at all times.
Human rights are typically protected by national and international laws, including the Universal Declaration of Human Rights adopted by the United Nations in 1948.
Democracy: Democracy is a form of government in which the power to make political decisions and shape public policies rests with the people.
Human rights and democracy are closely linked, as democracy is often seen as a means of ensuring the protection and fulfillment of human rights. In democratic societies, people have the opportunity to elect representatives who are accountable for upholding and defending human rights. These concepts are foundational in shaping just and equitable societies that respect the dignity and freedom of every individual.

Module 7

Code	Course/Module Title	ECTS	Semester
BEM121	Mathematics II	5	2
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
4	1	77	48
Description			
Mathematics II is an intermediate-level course that builds upon the mathematical concepts and skills introduced in Mathematics I. This course expands students' understanding of calculus, linear algebra, and differential equations. In calculus, students delve deeper into integration techniques, such as integration by parts, trigonometric substitutions, and partial fractions. They explore applications of integration, including calculating areas, volumes, and arc lengths. Sequences and series are studied in greater depth, with an emphasis on convergence tests and Taylor series expansions. In linear algebra, students learn about matrices, determinants, vector spaces, and linear transformations. They explore concepts such as eigenvalues, eigenvectors, and diagonalization. Differential equations are introduced, covering topics such as first-order equations, higher-order equations, systems of equations, and applications in physics and engineering. Through Mathematics II, students further develop their problem-solving skills, critical thinking abilities, and mathematical reasoning. This course provides a solid foundation for advanced mathematics and related disciplines, equipping students with the tools to analyze and solve complex mathematical problems in various fields of study.			

Module 8

Code	Course/Module Title	ECTS	Semester
BEM122	Engineering Mechanics-Dynamic	5	2
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
4	1	77	48
Description			
Engineering Mechanics - Dynamics is a course that focuses on the study of moving objects and the forces that affect their motion. It builds upon the principles learned in Engineering Mechanics - Statics and extends the understanding of mechanics to dynamic systems. Students learn how to analyze the motion of particles and rigid bodies using principles of kinematics and kinetics. Topics covered include linear and angular motion, force and acceleration, work and energy, impulse and momentum, and vibrations. Through this course, students gain the ability to solve engineering problems involving the motion of objects and the forces acting upon them. They learn to apply Newton's laws of motion and various mathematical techniques to model and analyze the behavior of dynamic systems. Engineering Mechanics - Dynamics is essential for understanding the movement and behavior of structures, machinery, and vehicles, enabling students to design and optimize mechanical systems for efficiency, safety, and performance.			

Module 9

Code	Course/Module Title	ECTS	Semester
BEM123	Engineering Drawing II	4	2
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
1	3	62	38
Description			
The Engineering Drawing II module is an advanced course that builds upon the fundamental principles and skills learned in Engineering Drawing I. This module focuses on developing students' proficiency in creating and interpreting complex technical drawings and specifications. Through this course, students learn advanced drafting techniques, such as orthographic projection, isometric and perspective drawing, auxiliary views, and sectional views. They gain expertise in dimensioning practices, tolerances, and geometric dimensioning and tolerancing (GD&T). Additionally, students explore advanced topics in computer-aided design (CAD), including 3D modeling and assembly drawings. The module emphasizes the application of industry standards and conventions, enabling students to effectively communicate their designs and specifications to other engineers and stakeholders. Practical assignments and projects provide opportunities for students to apply their knowledge to real-world engineering applications. By mastering Engineering Drawing II, students develop the skills necessary to create accurate and detailed technical drawings, enhancing their ability to communicate and visualize complex engineering concepts and designs. This module prepares students for professional careers in fields such as mechanical engineering, architecture, manufacturing, and product design.			

Module 10

Code	Course/Module Title	ECTS	Semester
BEM124	Electrical Engineering	6	2
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
3	3	92	58
Description			
The Electrical Engineering module is a comprehensive course that encompasses the study of electrical circuits, electromagnetism and power systems. It provides students with a strong foundation in the principles and applications of electrical engineering. Throughout the module, students learn about circuit analysis techniques, including Ohm's law, Kirchhoff's laws, and network theorems. Electromagnetic theory is covered, focusing on concepts such as electrostatics, magnetostatics, and electromagnetic waves. Power systems study involves the analysis of generation, transmission, and distribution of electrical power. Through laboratory experiments and hands-on projects, students apply theoretical concepts to practical scenarios, enhancing their problem-solving and analytical skills. The Electrical Engineering module equips students with the knowledge and skills required for designing, analyzing, and maintaining electrical systems, preparing them for careers in areas such as power generation, telecommunications, automation, and renewable energy.			

Module 11

Code	Course/Module Title	ECTS	Semester
BEM125	Production Engineering	8	2
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
4	4	122	78
Description			
The Production Engineering module is a specialized course that focuses on the principles and techniques involved in manufacturing and production processes. It equips students with the knowledge and skills necessary to optimize production systems and improve operational efficiency. Throughout the module, students learn about various manufacturing processes, including machining, casting, forming, and welding. They explore topics such as process planning, production scheduling, inventory management, quality control, and supply chain management. The module also covers lean manufacturing principles, including waste reduction, continuous improvement, and value stream mapping. Students gain hands-on experience through laboratory exercises and industrial visits, where they apply theoretical concepts to real-world production environments. Additionally, they learn about emerging technologies in production engineering, such as automation, robotics, and additive manufacturing. By completing the Production Engineering module, students develop the ability to analyze and optimize production systems, enhance productivity, and ensure quality in manufacturing processes. They are prepared for careers in industries such as automotive, aerospace, consumer goods, and electronics, where they contribute to the efficient and effective production of goods.			

Module 12

Code	Course/Module Title	ECTS	Semester
BEM126	Academic English Language	2	2
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	–	32	18
Description			
The Academic English module is designed to enhance students' proficiency in English specifically for academic purposes. This module focuses on developing the necessary language skills and strategies to succeed in academic settings, such as universities or research environments. Students in this module will improve their reading, writing, listening, and speaking skills, with a particular emphasis on academic vocabulary, critical thinking, and effective communication. The module covers a range of academic genres, including essays, research papers, presentations, and academic discussions. Through interactive activities, assignments, and feedback from instructors, students will learn to analyze academic texts, write coherent and well-structured essays, deliver presentations, and engage in academic discussions. The Academic English module equips students with the language proficiency required to excel in their academic pursuits and effectively communicate their ideas in a scholarly context.			

Module 13

Code	Course/Module Title	ECTS	Semester
BEM211	Engineering Mathematics I	4	3
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
4	-	62	38
Description			
The Engineering Mathematics I module is a fundamental course designed to provide students with a strong mathematical foundation essential for engineering disciplines. The module covers various mathematical topics and techniques that are directly applicable to engineering problems. Students learn concepts such as algebra, trigonometry, functions, limits, and calculus. They study differential calculus, including differentiation rules, optimization, and related rates. Integral calculus is also covered, focusing on definite and indefinite integrals, applications of integration, and numerical methods. Additionally, the module introduces concepts of complex numbers, matrices, and vectors. Through practical exercises and problem-solving tasks, students develop their mathematical reasoning, analytical thinking, and problem-solving skills. The Engineering Mathematics I module serves as a building block for more advanced mathematics courses and provides a strong mathematical foundation for engineering analysis, modeling, and design. It equips students with the necessary mathematical tools to solve engineering problems and lays the groundwork for further study in areas such as mechanics, electrical circuits, and fluid dynamics.			

Module 14

Code	Course/Module Title	ECTS	Semester
BEM212	Fluid Mechanics	9	3
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
5	4	137	88
Description			
The Fluid Mechanics module is a fundamental course that focuses on the behavior and properties of fluids, both liquids and gases. It explores the principles governing the flow of fluids and their applications in various engineering disciplines. Throughout the module, students learn about fluid statics, fluid dynamics, and the conservation laws of mass, momentum, and energy. They study topics such as fluid properties, pressure distribution, hydrostatic forces, Bernoulli's equation, flow in pipes, and flow measurement techniques. The module also covers topics like viscous flow, boundary layer theory, and dimensional analysis. Through theoretical concepts, mathematical modeling, and practical experiments, students gain an understanding of fluid behavior and the ability to analyze and solve engineering problems related to fluid systems. The Fluid Mechanics module is essential for fields such as mechanical engineering, civil engineering, chemical engineering, and aerospace engineering. It equips students with the knowledge and skills to design and analyze fluid systems, such as pipelines, pumps, turbines, and hydraulic systems, ensuring efficient and safe fluid flow in various applications.			

Module 15

Code	Course/Module Title	ECTS	Semester
BEM213	Strength of Materials	9	3
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
5	4	137	88
Description			
The Strength of Materials module is a crucial course that focuses on understanding the behavior of materials under various loading conditions. It provides students with the knowledge and skills to analyze and predict the response of structures and mechanical components to applied forces. Throughout the module, students learn about the mechanical properties of materials, including stress, strain, elasticity, and plasticity. They explore concepts such as axial loading, bending, torsion, and shear forces. The module covers topics like stress-strain relationships, Hooke's Law, Mohr's circle, beam deflection, and column buckling. Students also gain an understanding of failure theories and factors affecting material strength. By studying Strength of Materials, students develop the ability to analyze and design structures that can withstand the forces they will encounter in real-world applications. This module is vital for various engineering disciplines, including civil engineering, mechanical engineering, aerospace engineering, and structural engineering. It equips students with the tools to ensure the structural integrity and safety of engineered systems, contributing to the development of efficient and reliable structures and mechanical components.			

Module 16

Code	Course/Module Title	ECTS	Semester
BEM214	Advanced Computer Programming	6	3
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
4	2	92	58
Description			
The Advanced Computer Programming module is an intensive course designed to further enhance students' programming skills and expand their knowledge in advanced programming concepts and techniques. Building upon the foundational programming knowledge gained in previous courses, this module delves into more complex topics and advanced programming languages. Students explore advanced algorithms and data structures, such as graph algorithms, dynamic programming, and advanced sorting techniques. They learn about object-oriented programming principles, design patterns, and software architecture. The module covers advanced topics in database management, web development, and software testing and debugging. Students gain hands-on experience with industry-standard tools and frameworks used in software development. Through challenging programming assignments and projects, students apply their knowledge to solve real-world problems and develop sophisticated software applications. The Advanced Computer Programming module equips students with the skills necessary to tackle complex programming challenges and develop high-quality, scalable, and efficient software solutions. This module prepares students for careers as software engineers, application developers, or system analysts, where they can contribute to the development of cutting-edge software products and technologies.			

Module 17

Code	Course/Module Title	ECTS	Semester
BEM215	Crimes of Uprooted Baath Party	2	3
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	-	32	18
Description			
The Baath Party is a political organization that has played a significant role in the modern history of several countries in the Middle East, most notably Iraq and Syria. The Baath Party has been associated with various human rights abuses and crimes, especially during the rule of Saddam Hussein in Iraq. Here are some of the crimes and atrocities associated with the Uprooted Baath Party, particularly during the regime of Saddam Hussein: Mass Executions, Chemical Attacks, Ethnic Cleansing, Forced Disappearances, Torture and Abuse, Suppression of Uprisings, Invasion of Kuwait, War Crimes. It's important to note that these crimes were primarily associated with Saddam Hussein's regime and his particular interpretation and implementation of the Baathist ideology. The Baath Party as a political ideology itself does not inherently promote such actions, but these crimes were carried out under the leadership of the Uprooted Baath Party in Iraq. Saddam Hussein was eventually overthrown in 2003 following the US-led invasion of Iraq, and he faced trial and execution for some of these crimes.			

Module 18

Code	Course/Module Title	ECTS	Semester
BEM221	Engineering Mathematics II	4	4
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
4	-	62	38
Description			
The Engineering Mathematics II module is a continuation of the mathematical principles and techniques learned in Engineering Mathematics I. This module delves deeper into advanced mathematical concepts and their applications in engineering. Students explore topics such as vector calculus, differential equations, complex analysis, and numerical methods. Vector calculus covers topics like vector fields, line integrals, surface integrals, and the divergence and curl of a vector field. Differential equations study involves higher-order differential equations, systems of differential equations, Laplace transforms, and Fourier series. Complex analysis introduces complex numbers, complex functions, contour integration, and residues. Numerical methods focus on numerical approximation techniques for solving mathematical problems, including interpolation, numerical integration, and solving differential equations numerically. Through theoretical discussions, problem-solving exercises, and computational assignments, students develop their mathematical modeling, analysis, and problem-solving skills. The Engineering Mathematics II module equips students with advanced mathematical tools to tackle complex engineering problems, paving the way for further study in specialized engineering disciplines and research areas.			

Module 19

Code	Course/Module Title	ECTS	Semester
BEM222	Thermodynamics	8	4
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
4	4	107	68
Description			
The Thermodynamics module is a fundamental course in engineering that explores the principles governing energy transfer and the behavior of gases, liquids, and solids. This module provides students with a comprehensive understanding of thermodynamic concepts and their applications in engineering systems. Students learn about the laws of thermodynamics, including energy conservation, entropy, and the concept of equilibrium. They study thermodynamic properties such as temperature, pressure, and specific heat, and their relationships in different processes. The module covers topics such as heat transfer, work, ideal and real gases, vapor and gas power cycles, refrigeration, and heat pump systems. Students also gain an understanding of thermodynamic relations, equations of state, and the behavior of fluids. Through practical experiments and problem-solving exercises, students apply thermodynamic principles to analyze and optimize energy systems. The Thermodynamics module equips students with the knowledge and skills to design and evaluate the performance of various energy conversion systems, such as power plants, engines, and refrigeration systems. It is essential for fields such as mechanical engineering, chemical engineering, and energy engineering, providing students with a solid foundation for understanding and manipulating energy in engineering applications.			

Module 20

Code	Course/Module Title	ECTS	Semester
BEM223	Engineering Metallurgy	7	4
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
4	3	107	68
Description			
The Engineering Metallurgy module is a specialized course that focuses on the properties, behavior, and processing of metallic materials used in engineering applications. This module provides students with a deep understanding of the structure-property relationships of metals and alloys. Students learn about the microstructure of metals, crystallography, phase diagrams, and the effects of alloying elements on material properties. They explore various types of metallic materials, including steels, aluminum alloys, titanium alloys, and superalloys, and understand their mechanical, thermal, and corrosion properties. The module covers topics such as heat treatment, metal forming, welding, and surface engineering techniques. Students gain hands-on experience through laboratory experiments, where they examine the microstructures of metals and perform mechanical tests. Additionally, they learn about materials selection, failure analysis, and the principles of materials characterization techniques. The Engineering Metallurgy module prepares students to make informed decisions regarding the selection,			

processing, and performance of metallic materials in engineering applications. It is vital for fields such as materials engineering, mechanical engineering, aerospace engineering, and manufacturing, equipping students with the knowledge and skills to design, analyze, and optimize metal-based components and structures for various industries.

Module 21

Code	Course/Module Title	ECTS	Semester
BEM224	Mechanical Drawing	4	4
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
1	3	62	38
Description			
The Mechanical Drawing module is a fundamental course that focuses on developing students' skills in creating precise and detailed technical drawings used in mechanical engineering. This module emphasizes the principles of orthographic projection, which involves representing three-dimensional objects on a two-dimensional plane. Students learn how to create accurate and properly scaled drawings of mechanical components and assemblies, using industry-standard drawing techniques and conventions. The module also covers dimensioning practices, tolerances, and geometric dimensioning and tolerancing (GD&T). Through practical assignments and projects, students apply their knowledge to real-world engineering applications, where they develop the ability to interpret and communicate engineering designs effectively. The Mechanical Drawing module is essential for mechanical engineers, enabling them to convey their ideas and designs to manufacturers, fabricators, and other engineering professionals accurately. It lays the foundation for advanced courses in engineering design, simulation, and manufacturing, providing students with the necessary skills to excel in their engineering careers.			

Module 22

Code	Course/Module Title	ECTS	Semester
BEM225	Electrical Machines	7	4
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
4	3	107	68
Description			
The Electrical Machines module is a comprehensive course that focuses on the study of various types of electrical machines and their applications in engineering. This module covers the principles of operation, design, and analysis of electrical machines such as generators, motors, and transformers. Students learn about the fundamental concepts of electromagnetism, magnetic circuits, and energy conversion. They explore topics such as electromagnetic induction, rotating magnetic fields, armature windings, and torque production. The module also covers aspects of machine performance, including efficiency, losses, and power factor correction. Through theoretical concepts, laboratory experiments, and practical assignments, students gain hands-on experience in analyzing and testing the performance of electrical			

machines. They develop the skills necessary to design and troubleshoot electrical machines, select appropriate machines for specific applications, and optimize their operation. The Electrical Machines module is essential for electrical engineers, enabling them to understand the principles behind electrical machines and apply their knowledge in various industries such as power generation, transportation, manufacturing, and renewable energy. It equips students with the expertise required to contribute to the development and maintenance of efficient and reliable electrical systems.

Module 23

Code	Course/Module Title	ECTS	Semester
BEM311	Engineering Analysis	5	5
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
4	1	77	48
Description			

The Engineering Analysis module is a crucial course that focuses on developing students' skills in mathematical modeling, problem-solving, and data analysis techniques relevant to engineering disciplines. This module equips students with a strong foundation in mathematical methods and analytical tools used to analyze and solve engineering problems. Students learn various mathematical techniques, including linear algebra, differential equations, numerical methods, and optimization. They explore topics such as Fourier analysis, Laplace transforms, eigenvalues, and eigenvectors. The module also covers statistical analysis and probability theory, enabling students to analyze and interpret experimental data and make informed engineering decisions. Through theoretical concepts, practical exercises, and computer simulations, students gain hands-on experience in applying mathematical techniques to real-world engineering problems. The Engineering Analysis module enhances students' critical thinking, problem-solving, and decision-making skills, providing them with a solid framework to tackle complex engineering challenges. It is an essential module for all engineering disciplines, as it forms the basis for further study and application of advanced analytical tools and techniques in specialized engineering fields.

Module 24

Code	Course/Module Title	ECTS	Semester
BEM312	Gas Dynamics & Turbomachines	8	5
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
4	4	122	78

Description

The Gas Dynamics & Turbomachines module is a specialized course that focuses on the study of compressible fluid flow and the principles of turbomachinery. This module covers the fundamentals of gas dynamics, including the behavior of compressible fluids, shock waves, and supersonic flow. Students learn about the analysis and design of turbomachinery, such as gas turbines, jet engines, and compressors. They study topics such as velocity triangles, flow coefficients, performance characteristics, and the thermodynamics of turbomachines. The module also covers the principles of combustion, fuel-air mixtures, and the environmental impact of gas turbine systems. Through theoretical lectures, laboratory experiments, and design projects, students gain practical skills in analyzing and designing turbomachines, as well as understanding the performance and efficiency of gas turbine systems. The Gas Dynamics & Turbomachines module prepares students for careers in the aerospace, power generation, and energy sectors, where they can contribute to the design, analysis, and optimization of gas turbine systems and other turbomachinery. It emphasizes the application of fluid dynamics and thermodynamics principles in real-world engineering applications.

Module 25

Code	Course/Module Title	ECTS	Semester
BEM313	Manufacturing Processes	9	5
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
5	4	137	88

Description

The Manufacturing Processes module is a comprehensive course that focuses on the various techniques and methods used in manufacturing products. This module covers a wide range of manufacturing processes, including casting, forming, machining, welding, and additive manufacturing. Students learn about the principles, advantages, and limitations of each process and gain hands-on experience through practical workshops and laboratory sessions. They study topics such as material properties, process selection, tooling, quality control, and process optimization. The module also covers advanced manufacturing technologies, including computer-aided manufacturing (CAM), robotics, and automation. Through project work and industry case studies, students develop their skills in process planning, production scheduling, and cost estimation. The Manufacturing Processes module equips students with the knowledge and skills necessary to design, analyze, and optimize manufacturing processes in various industries. It prepares students for careers in manufacturing engineering, production management, and process improvement, where they play a vital role in ensuring the efficient and cost-effective production of high-quality products.

Module 26

Code	Course/Module Title	ECTS	Semester
BEM314	Internal Combustion Engines	8	5
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
4	4	122	78
Description			
The Internal Combustion Engines module is an in-depth course that focuses on the principles, operation, and design of internal combustion engines used in various transportation and power generation applications. This module provides students with a comprehensive understanding of the thermodynamic cycles, combustion processes, and performance characteristics of internal combustion engines. Students learn about the different types of engines, including spark-ignition (SI) engines and compression-ignition (CI) engines, and explore topics such as air-fuel mixing, combustion kinetics, fuel injection systems, and engine control. The module covers aspects such as engine performance parameters, emissions control, and the impact of engine design on efficiency and environmental sustainability. Through laboratory experiments, students gain hands-on experience in testing and analyzing engine performance, fuel consumption, and emissions. The Internal Combustion Engines module prepares students for careers in automotive engineering, power generation, and renewable energy, where they can contribute to the design, development, and optimization of internal combustion engines and alternative propulsion systems. It equips students with the knowledge and skills necessary to address the challenges and opportunities in the field of internal combustion engines and contribute to the development of more efficient and environmentally friendly engine technologies.			

Module 27

Code	Course/Module Title	ECTS	Semester
BEM321	Numerical Analysis	6	6
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
3	3	92	58
Description			
The Numerical Analysis module is a comprehensive course that focuses on the development and application of numerical methods for solving mathematical problems. This module equips students with the tools and techniques to approximate solutions to complex mathematical equations that are difficult or impossible to solve analytically. Students learn about numerical algorithms and computational techniques for root finding, interpolation, numerical integration, and differential equations. They explore topics such as numerical stability, convergence, error analysis, and the trade-offs between accuracy and computational efficiency. The module also covers the implementation of numerical methods using programming languages and software tools. Through practical assignments and simulations, students gain hands-on experience in solving real-world engineering problems using numerical techniques. The Numerical Analysis module enhances students' critical thinking, problem-solving, and programming skills, enabling them to analyze and interpret data, make informed engineering decisions, and develop			

computational models for engineering applications. It is an essential module for various engineering disciplines, providing students with the necessary foundation to tackle complex mathematical problems and apply numerical methods in their future engineering careers.

Module 28

Code	Course/Module Title	ECTS	Semester
BEM322	Heat Transfer	9	6
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
5	4	137	88
Description			
The Heat Transfer module is a comprehensive course that explores the principles and applications of heat transfer in various engineering systems. This module focuses on the fundamental modes of heat transfer: conduction, convection, and radiation. Students learn about the mechanisms and mathematical models that govern heat transfer in solids, fluids, and gases. They study topics such as Fourier's law of heat conduction, convective heat transfer coefficients, boundary layer theory, and radiation heat transfer. The module covers heat transfer in different engineering applications, including heat exchangers, refrigeration systems, and thermal management of electronic devices. Students gain hands-on experience through laboratory experiments, where they measure and analyze heat transfer rates, conduct thermal conductivity tests, and study heat exchanger performance. Additionally, they learn about heat transfer analysis using computational tools and simulation software. The Heat Transfer module equips students with the knowledge and skills to design and optimize heat transfer systems, analyze thermal performance, and make informed decisions regarding heat transfer processes in engineering applications.			

Module 29

Code	Course/Module Title	ECTS	Semester
BEM323	Theory of Machines	8	6
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
4	4	122	78
Description			
The Theory of Machines module is a specialized course that focuses on the study of mechanisms and the principles underlying their motion and operation. This module delves into the analysis and design of various mechanical systems, including linkages, gears, cams, and mechanisms used in machines. Students learn about kinematics, dynamics, and the behavior of machines subjected to different types of forces and motion. They study topics such as displacement, velocity, acceleration, force analysis, balancing, and vibration analysis. The module also covers the principles of power transmission and the selection and design of machine components for optimal performance. Through theoretical concepts, computer simulations, and practical experiments, students gain hands-on experience in analyzing and			

designing mechanical systems. They develop skills in mechanism synthesis, optimization, and the application of computer-aided design (CAD) software. The Theory of Machines module equips students with the knowledge and skills to analyze, design, and optimize machines in various industries, such as automotive, robotics, manufacturing, and automation. It forms a vital foundation for advanced courses in mechanical engineering, providing students with a deep understanding of the principles and applications of machines and mechanisms.

Module 30

Code	Course/Module Title	ECTS	Semester
BEM324	Design of Machine Elements I	7	6
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
3	4	107	68
Description			
The Design of Machine Elements I module is a comprehensive course that focuses on the principles and methodologies involved in the design of machine components. This module provides students with the knowledge and skills to analyze engineering problems, select appropriate materials, and design machine elements for various applications. Students learn about the design considerations for components such as shafts, bearings, gears, belts, and springs. They study topics such as stress analysis, fatigue, and failure criteria, as well as factors like manufacturability, cost, and environmental sustainability. Through theoretical lectures, practical examples, and design projects, students develop their skills in conceptualizing, modeling, and prototyping machine elements. The Design of Machine Elements I module prepares students for careers in mechanical engineering, where they can contribute to the design, analysis, and optimization of machine components and systems. It emphasizes the application of engineering principles and standards, ensuring that the designed elements meet the required specifications and perform reliably in real-world scenarios.			

Module 31

Code	Course/Module Title	ECTS	Semester
BEM324	Design of Machine Elements II	4	7
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
3	1	62	38
Description			
The Design of Machine Elements II module is an advanced course that builds upon the principles and concepts learned in Design of Machine Elements I. This module focuses on the design and analysis of complex machine components and systems. Students delve deeper into topics such as advanced stress analysis, material selection, failure modes, and optimization techniques. They explore the design considerations for components like gears, bearings, shafts, springs, and fasteners in more intricate engineering applications. The module emphasizes the			

integration of engineering principles with practical considerations such as cost, weight, manufacturability, and environmental sustainability. Through theoretical lectures, case studies, and design projects, students enhance their skills in advanced modeling, simulation, and prototyping of machine elements. They learn to apply industry-standard software tools and techniques for conducting finite element analysis, life prediction, and reliability analysis. The Design of Machine Elements II module equips students with the knowledge and skills to tackle complex engineering challenges in machine component design. It prepares them for careers in industries such as automotive, aerospace, manufacturing, and robotics, where they can contribute to the design and development of innovative and reliable machine systems.

Module 32

Code	Course/Module Title	ECTS	Semester
BEM412	Engineering Materials	4	7
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
4	-	62	38
Description			

The Engineering Materials module is a comprehensive course that focuses on the study of materials used in engineering applications. This module explores the properties, characteristics, and behavior of various materials, including metals, polymers, ceramics, and composites. Students learn about the structure-property relationships, phase diagrams, mechanical properties, and processing techniques associated with different materials. They study topics such as material selection, material testing, corrosion, and failure analysis. The module covers the principles of material characterization techniques, including microscopy, spectroscopy, and mechanical testing. Through laboratory experiments and practical exercises, students gain hands-on experience in material testing, analysis, and characterization. They also learn about the impact of materials on design, manufacturing, and sustainability in engineering applications. The Engineering Materials module equips students with the knowledge and skills to select appropriate materials for specific engineering applications, analyze material behavior under different conditions, and make informed decisions regarding material processing and manufacturing. It is essential for all engineering disciplines, providing students with a solid foundation in understanding and working with materials in their future engineering careers.

Module 33

Code	Course/Module Title	ECTS	Semester
BEM413	Power Plants	8	7
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
4	4	122	78
Description			
The Power Plants module is a comprehensive course that focuses on the study of various types of power generation systems and their operations. This module covers the principles, design, and operation of power plants, including thermal power plants, hydroelectric power plants, and renewable energy systems. Students learn about the components, processes, and technologies involved in power generation, such as boilers, turbines, generators, transformers, and control systems. They study topics such as power plant efficiency, environmental considerations, grid integration, and energy storage. The module also covers the analysis and optimization of power plant performance, including load forecasting, maintenance strategies, and energy management. Through theoretical lectures, case studies, and practical simulations, students gain a comprehensive understanding of power generation systems and their impact on energy production, consumption, and sustainability. The Power Plants module prepares students for careers in the power and energy sector, enabling them to contribute to the design, operation, and management of power plants and the development of innovative and sustainable energy solutions.			

Module 34

Code	Course/Module Title	ECTS	Semester
BEM414	Control & Measurements	9	7
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
5	4	137	88
Description			
The Control & Measurements module is a comprehensive course that focuses on the principles and techniques of control systems and measurements in engineering applications. This module covers the fundamentals of control theory, including system modeling, feedback control, and stability analysis. Students learn about different control strategies such as proportional-integral-derivative (PID) control, state-space control, and digital control. They study topics like sensor technologies, signal conditioning, data acquisition, and measurement uncertainty. The module also explores the principles of system identification, calibration, and data analysis. Through practical lab exercises and projects, students gain hands-on experience in designing and implementing control systems, as well as conducting measurements and data analysis using industry-standard equipment and software. The Control & Measurements module equips students with the knowledge and skills to analyze and design control systems, perform accurate measurements, and make informed engineering decisions based on experimental data. It is essential for various engineering disciplines, including automation, robotics, mechatronics, and process control, providing students with a solid foundation in control theory and measurement techniques.			

Module 35

Code	Course/Module Title	ECTS	Semester
BEM415	Engineering Project	5	7
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	3	77	48
Description			
The Engineering Project module is a culmination of students' engineering education, providing an opportunity to apply their knowledge and skills to a real-world project. This module emphasizes project management, problem-solving, teamwork, and effective communication. Students are required to identify and define a project scope, conduct research, design and analyze solutions, and develop a comprehensive project plan. They learn to consider technical, economic, ethical, and environmental factors while proposing viable engineering solutions. Throughout the project, students collaborate in teams, work within given constraints, and implement their designs. They are also encouraged to consider the social and global impact of their projects. The Engineering Project module enhances students' critical thinking, decision-making, and project management skills, preparing them for real-world engineering challenges. It offers an opportunity to integrate and apply the knowledge gained from various disciplines, fostering creativity, innovation, and problem-solving abilities. The module culminates in a final project presentation and report, where students demonstrate their engineering competency and ability to deliver effective solutions.			

Module 36

Code	Course/Module Title	ECTS	Semester
BEM421	Renewable Energy	4	8
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
3	1	62	48
Description			
The Renewable Energy module is a specialized course that focuses on the study of sustainable energy sources and their integration into power generation systems. This module explores various renewable energy technologies, such as solar, wind, hydro, biomass, and geothermal energy. Students learn about the principles, design, and operation of these technologies, including resource assessment, system components, and grid integration. They study topics such as energy conversion, storage, and distribution, as well as the environmental and socio-economic aspects of renewable energy. The module covers the analysis and optimization of renewable energy systems, including modeling, simulation, and economic viability. Through theoretical lectures, practical experiments, and field visits, students gain hands-on experience in renewable energy systems and their application in real-world scenarios. The Renewable Energy module prepares students for careers in the renewable energy sector, where they can contribute to the development, implementation, and management of sustainable energy solutions. It emphasizes the importance of renewable energy in addressing global energy challenges and promoting a greener and more sustainable future.			

Module 37

Code	Course/Module Title	ECTS	Semester
BEM422	Industrial Engineering and Management	5	8
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
4	1	77	48
Description			
The Industrial Engineering and Management module is a comprehensive course that focuses on designing, operating, managing, and continuously improving manufacturing and service systems so that they are effective and efficient. Also the management part involves the planning and organization of a company's resources to move a specific task, event, or duty towards completion. It can involve a one-time project or an ongoing activity, and resources managed include personnel, finances, and technology. the Industrial Engineering and Management course provides students with a well-rounded understanding of optimizing systems and processes in industrial and service sectors, as well as the ability to plan, organize, and manage projects efficiently. It prepares students for careers where they can contribute to enhancing productivity, quality, and overall organizational performance. Through a combination of theoretical concepts, case studies, simulations, and practical exercises, students develop the skills needed to analyze systems, optimize processes, manage resources, and successfully execute projects in industrial and service-oriented environments. The course equips them with a strong foundation for careers in various industries, including manufacturing, logistics, healthcare, consulting, and project management.			

Module 38

Code	Course/Module Title	ECTS	Semester
BEM423	Air Conditioning and Refrigeration	8	8
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
5	4	137	63
Description			
The Air Conditioning and Refrigeration module is a specialized course that focuses on the principles, design, and operation of HVAC (Heating, Ventilation, and Air Conditioning) systems and refrigeration systems. This module covers the fundamentals of thermodynamics, heat transfer, psychrometrics, and fluid mechanics as they apply to air conditioning and refrigeration processes. Students learn about the components and systems used in HVAC and refrigeration, including compressors, condensers, evaporators, expansion valves, and controls. They study topics such as load calculations, equipment selection, duct design, refrigerant properties, and system performance analysis. The module also addresses energy efficiency, environmental considerations, and regulations related to air conditioning and refrigeration. Through theoretical lectures, hands-on experiments, and design projects, students gain practical skills in system design, installation, maintenance, and troubleshooting. The Air			

Conditioning and Refrigeration module prepares students for careers in the HVAC and refrigeration industry, enabling them to contribute to the design, operation, and maintenance of systems that provide comfortable and controlled environments for various applications, such as residential, commercial, and industrial buildings.

Module 90

Code	Course/Module Title	ECTS	Semester
BEM424	Theory of Vibrations	8	8
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
4	4	122	78
Description			
The Theory of Vibrations module is a specialized course that focuses on the study of mechanical vibrations and their analysis in engineering systems. This module covers the principles of vibration theory, including single-degree-of-freedom and multi-degree-of-freedom systems. Students learn about the behavior of vibrating systems, including natural frequencies, mode shapes, damping, and resonance. They study topics such as free and forced vibrations, harmonic and transient response, and vibration isolation techniques. The module also covers vibration measurement and analysis methods using sensors and signal processing techniques. Through theoretical lectures, laboratory experiments, and numerical simulations, students gain a deep understanding of vibration phenomena and develop skills in analyzing and predicting the dynamic behavior of mechanical systems. The Theory of Vibrations module prepares students for careers in various engineering fields, such as aerospace, automotive, and structural engineering, where they can contribute to the design, analysis, and control of systems to minimize unwanted vibrations and ensure the safe and efficient operation of machinery and structures.			

Module 40

Code	Course/Module Title	ECTS	Semester
BEM425	Engineering Project (continued)	5	8
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	3	77	48
Description			
The Engineering Project module is a culmination of students' engineering education, providing an opportunity to apply their knowledge and skills to a real-world project. This module emphasizes project management, problem-solving, teamwork, and effective communication. Students are required to identify and define a project scope, conduct research, design and analyze solutions, and develop a comprehensive project plan. They learn to consider technical, economic, ethical, and environmental factors while proposing viable engineering solutions. Throughout the project, students collaborate in teams, work within given constraints, and implement their designs. They are also encouraged to consider the social and global impact of their projects. The Engineering Project module enhances students' critical thinking, decision-			

making, and project management skills, preparing them for real-world engineering challenges. It offers an opportunity to integrate and apply the knowledge gained from various disciplines, fostering creativity, innovation, and problem-solving abilities. The module culminates in a final project presentation and report, where students demonstrate their engineering competency and ability to deliver effective solutions.

3. Contact

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MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Mathematics I**			**Module Delivery**	
Module Type	**Basic**			☒ **Theory** ☒ **Lecture** ☐ **Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**BEM111**				
ECTS Credits	**5**				
SWL (hr/sem)	**125**				
Module Level	1		**Semester of Delivery**	1	
Administering Department	Type Dept. Code		**College**	Type College Code	
Module Leader	Mohammed Bakir Mohsen		**e-mail**	mohammed.mohsen@uobasrah.edu.iq	
Module Leader's Acad. Title	Lecture		**Module Leader's Qualification**	Ph.D.	
Module Tutor	Name (if available)		**e-mail**	E-mail	
Peer Reviewer Name	Name		**e-mail**	E-mail	
Scientific Committee Approval Date	01/06/2023		**Version Number**	1.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None	**Semester**	
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	This course reviews the basic ideas you need to start calculus for engineering, also for students intending to continue to more advanced courses in calculus and mathematics in general Topics include a brief review of functions, followed by discussion of limits, derivatives, and applications of differential calculus to real-world problem areas. An introduction to integration concludes the course, with a brief description of transcendental functions.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Illustrate the principle of calculus. 2. Gain the required mathematical skills to solve different problems. 3. Improve the essential skills to treat with different mathematical problems. 4. Study the principal criteria for modelling any industrial system mathematically. 5. Ability to solve mathematical problems. 6. Ability to analyze and resolve any mathematical problem. 7. Writing scientific reports. 8. Gain the required experience to deal with industrial systems mathematically.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. 1- The Cartesian Plane and Functions : The distance formula, lines, The slope and the equation of a line, Parallel and perpendicular lines, circles domain and range, Functions and their graphs, The Trigonometric Functions and Graphs of Trigonometric Functions, Graphs of Trigonometric Functions . [6 hrs] 2- The Limits and Continuity ; Calculating Limits Using the Limit Laws, Properties of Limits, Limits of Trigonometric Function, Special Trigonometric Limits, L-Hopital's Rule, Continuity, Properties of Continuous Function. [6 hrs] 3- Differentiation : Definition of the Derivative, Differentiation Rules Definition of the Derivative, Differentiation Rules, Derivatives of Trigonometric Functions, The Chain Rule, Implicit Differentiation, Related Rates. [10 hrs] 4- Applications of Differentiation : The First Derivative Test, Concavity and the Second Derivative Test, The First Derivative Test, Concavity and the Second Derivative Test, Curve Sketching, Optimization Problems, The mean value Theorem. [6 hrs] 5- Integration : The Definite Integral, Basic Integration Rules, Integration of Trigonometric Functions, The Area under the Curve, The Natural Logarithmic Function, The Derivative and Integration of Natural Logarithmic Function, First Law of Calculus, and The mean value Theorem for Integral, First Law of Calculus, and The mean value Theorem for Integral. [12 hrs] 6- Inverse Functions : Exponential Functions, Rules and Properties of the Exponential Functions, The Derivative and Integration of Exponential Function, Exponential Functions, Rules and Properties of the Exponential Functions, The Derivative and Integration of Exponential Function, The Exponential Function for Bases other Than (e) (a^x and $\log_a{}^x$), Derivative and Integration the Exponential Function for Bases other Than (e)products. Equations of lines and planes in the space, Inverse Trigonometric Functions, Derivative and Integration of Trigonometric Functions, and Hyperbolic Function. [14 hrs].

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	• Reading and self-learning. • Training and activities during lecture. • HomeWorks. • Suggesting some websites for extra reading. Discussions and workshops.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	77	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	5
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	48	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	3.2
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	125		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	2	10% (10)	5, 10	LO #1, 2, 10 and 11
	Assignments	2	10% (10)	2, 12	LO # 3, 4, 6 and 7
	Projects / Lab.	1	10% (10)	Continuous	All
	Report	1	10% (10)	13	LO # 5, 8 and 10
Summative assessment	**Midterm Exam**	2 hr	10% (10)	7	LO # 1-7
	Final Exam	2 hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	The distance formula, lines, The slope and the equation of a line, Parallel and perpendicular lines, circles domain and range
Week 2	Functions and their graphs,The Trigonometric Functions and Graphs of Trigonometric Functions.
Week 3	Graphs of Trigonometric Functions. Calculating Limits Using the Limit Laws, Properties of Limits,
Week 4	Limits of Trigonometric Function, Special Trigonometric Limits
Week 5	L-Hopital's Rule, Continuity, Properties of Continuous Function. Definition of the Derivative, Differentiation Rules Definition of the Derivative, Differentiation Rules
Week 6	Derivatives of Trigonometric Functions, The Chain Rule.
Week 7	Implicit Differentiation, Related Rates.
Week 8	The First Derivative Test, Concavity and the Second Derivative Test, The First Derivative Test, Concavity and the Second Derivative Test, Curve Sketching,
Week 9	Optimization Problems, The mean value Theorem. The Definite Integral, Basic Integration Rules,
Week 10	Integration of Trigonometric Functions, The Area under the Curve
Week 11	The Natural Logarithmic Function, The Derivative and Integration of Natural Logarithmic Function, First Law of Calculus, and The mean value Theorem for Integral.
Week 12	First Law of Calculus, and The mean value Theorem for Integral. Exponential Functions, Rules and Properties of the Exponential Functions, The Derivative and Integration of Exponential Function
Week 13	Exponential Functions, Rules and Properties of the Exponential Functions, The Derivative and Integration of Exponential Function
Week 14	The Exponential Function for Bases other Than (e) (a^x and $\log_a{}^x$), Derivative and Integration the Exponential Function for Bases other Than (e)products. Equations of lines and planes in the space.
Week 15	Inverse Trigonometric Functions, Derivative and Integration of Trigonometric Functions, and Hyperbolic Function

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Thomas' Calculus I Maurice D. Weir, Joel Hass, George B. Thomas.-12th ed.	Yes
Recommended Texts	Advanced Engineering Mathematics, By Erwin Kreyszig, 1999, John Wiley & Sons, Inc	Yes
Websites		

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks (%)**	**Definition**
Success Group (50 - 100)	**A -** Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX –** Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Vector Mechanical for Engineers STATIC**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☒ **Lecture** ☐ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**BEM112**				
ECTS Credits	**6**				
SWL (hr/sem)	**150**				
Module Level	1		**Semester of Delivery**	1	
Administering Department	MECHANICAL		**College**	Engineering College	
Module Leader	Dr. Raad Jamal Jassim		**e-mail**	Raad.jassim@uobasrah.edu.iq	
Module Leader's Acad. Title	lecture		**Module Leader's Qualification**	Ph.D.	
Module Tutor	Huda Abdullah Abdulkareem		**e-mail**	Huda.abdulkareem@uobasra.edu.iq	
Peer Reviewer Name			**e-mail**		
Scientific Committee Approval Date	01/06/2023		**Version Number**	1.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None	**Semester**	
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	1. Preparing and qualifying specialized engineers to meet the requirements of the labor market in its private and public sectors in static mechanics through diversifying the methods of learning and teaching and training students to apply the acquired knowledge and skills to solve real problems. 2. Providing distinguished academic programs in the field of static mechanics, both theoretical and practical, to comply with international standards of academic quality and meet the needs of the labor market. 3. Encouraging and developing scientific research in the fields of static mechanics in general, and studying and analyzing loads (such as forces, torques and rotations) in physical systems in a state of static equilibrium. 4. Preparing a stimulating environment for faculty members to develop their knowledge and educational and research skills. 5. Building and developing partnerships with the governmental and private sectors
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	A- Knowledge and Understanding A1. Practice the basic skills of analyzing simple mechanical systems. A2. cquire skills in analyzing mechanical systems that are in a constant state of equilibrium A3. cquire basic skills in focusing on a free body diagram and on choosing an appropriate coordination system B. Subject-specific skills B1. Ability to analyze mechanical systems. B2. The ability to think about addressing a particular problem or issue. B3. Solve mechanical problems. B4. The ability to gain experience in dealing with mechanical systems
Indicative Contents المحتويات الإرشادية	• Readings, self-learning, panel discussions. • Exercises and activities in the lecture. • Homework. • Directing students to some websites to benefit and develop capabilities. • Conducting seminars to explain and analyze a specific issue and find solutions to it.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Readings, self-learning, panel discussions. Exercises and activities in the lecture. Homework. Directing students to some websites to benefit and develop capabilities

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	92	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	6
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	58	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	3.8
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	150		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	2	10% (10)	5, 10	LO #1, 2, 10 and 11
	Assignments	2	10% (10)	2, 12	LO # 3, 4, 6 and 7
	Projects / Lab.	1	10% (10)	Continuous	All
	Report	1	10% (10)	13	LO # 5, 8 and 10
Summative assessment	**Midterm Exam**	2 hr	10% (10)	7	LO # 1-7
	Final Exam	2 hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Newton's Three Laws of Motion, Units of Measurement (General Principles)
Week 2	Vector Operations (Force Vectors)
Week 3	Vector Addition of Forces, Addition of a System of Coplanar Forces(Force Vectors)
Week 4	Condition for the Equilibrium of a Particle (Equilibrium of a Particle)
Week 5	The Free-Body Diagram, Coplanar Force Systems (Equilibrium of a Particle)
Week 6	Moment of a Force -Scalar Formulation (Force System Resultants)
Week 7	Principle of Moments, Moment of a Couple, Conditions for Rigid-Body Equilibrium (Force system Resultants)
Week 8	Free-Body Diagrams, Equations of Equilibrium (Equilibrium of a Rigid Body)
Week 9	Condition for the Equilibrium of a Particle (Equilibrium of a Particle)
Week 10	Characteristics of Dry Friction (Friction)
Week 11	Problems Involving Dry Friction (Friction)
Week 12	Center of Gravity, Center of Mass, and the Centroid of a Body (Center of Gravity and Centroid)
Week 13	Composite Bodies (Center of Gravity and Centroid)
Week 14	Definition of Moments of Inertia for Areas, Parallel-Axis Theorem for an Area (Moments of Inertia)
Week 15	Radius of Gyration of an Area, Moments of Inertia for Composite Areas (Moments of Inertia)

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Vector Mechanics for Engineers, Static FOR Beer	Yes
Recommended Texts	Vector Mechanics for Engineers, Static for HLBBELER	No
Websites		

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks (%)**	**Definition**
Success Group (50 - 100)	**A -** Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX –** Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Engineering drawing**			**Module Delivery**	
Module Type	**Support**			☒ **Theory** ☒ **Lecture** ☐ **Lab** ☐ **Tutorial** ☒ **Practical** ☐ **Seminar**	
Module Code	**BEM113**				
ECTS Credits	**4**				
SWL (hr/sem)	**100**				
Module Level	1		**Semester of Delivery**	1	
Administering Department	Type Dept. Code		**College**	Type College Code	
Module Leader	Sana Mahdi Shrama		**e-mail**	sana.mahdi@uobasrah.edu.iq	
Module Leader's Acad. Title	Professor		**Module Leader's Qualification**	Ph.D.	
Module Tutor	Name (if available)		**e-mail**	E-mail	
Peer Reviewer Name	Name		**e-mail**	E-mail	
Scientific Committee Approval Date	01/06/2023		**Version Number**	1.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None	**Semester**	
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	1. Preparing and qualifying specialized engineers to meet the requirements of the labor market in the private and public sectors in mechanical engineering through diversifying the methods of learning and teaching and training students to apply the acquired knowledge and skills to solve real problems. 2. Providing distinguished academic programs in the field of mechanical engineering, both theoretical and practical, and international rules of academic quality that meet the needs of the labor market. 3. Encouraging and developing scientific research in the fields of mechanical engineering. 4. Preparing a stimulating environment for faculty members to develop their knowledge and educational and research skills
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	A. Knowledge and Understanding A1. Clarify the basic concepts of engineering drawing and the use of AutoCAD in social and industrial fields A2. Acquire the skills to solve the problems. B. Subject-specific skills B1 - The ability to design in the completion of work B2 - The ability to think about the visualization of shapes according to the topics related to the drawing B 3 - The purpose of the engineering drawing is to be used as a guide for the manufacture or implementation of the drawn shape.
Indicative Contents المحتويات الإرشادية	• Readings, self-learning, panel discussions. • Exercises and activities in the lecture. • Homework. • Directing students to some websites to benefit and develop capabilities. • Conducting seminars to explain and analyze a specific issue and find solutions to it.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	1. Explanation and clarification through lectures. 2. The method of displaying scientific materials on display devices: data show, smart boards, and plasma screens. 3. Self-learning through homework and mini-projects within the lectures. 4. Halls of application for engineering drawing 5. Graduation projects. 6. Summer training through the application in the design department

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	62	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	38	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	2.5
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	100		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	2	10% (10)	5, 10	LO #1, 2, 10 and 11
	Assignments	2	10% (10)	2, 12	LO # 3, 4, 6 and 7
	Projects / Lab.	1	10% (10)	Continuous	All
	Report	1	10% (10)	13	LO # 5, 8 and 10
Summative assessment	**Midterm Exam**	2 hr	10% (10)	7	LO # 1-7
	Final Exam	2 hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري الكورس الاول	
	Material Covered
Week 1	Principles of engineering drawing + duties
Week 2	Principles of engineering drawing + duties
Week 3	Engineering Operations + Duties
Week 4	Engineering Operations + Duties
Week 5	Engineering Operations + Duties
Week 6	Engineering Operations + Duties
Week 7	Engineering Operations + Duties
Week 8	Mid-term Exam + Drawing projections + duties
Week 9	Drawing projections + duties
Week 10	Drawing projections + duties
Week 11	Drawing projections + duties
Week 12	Drawing missed views + Duties
Week 13	Drawing missed views + Duties
Week 14	Drawing missed views + Duties
Week 15	Drawing missed views + Duties
Week 16	**Preparatory week before the final Exam**

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	الرسم الهندسي / عبد الرسول الخفاف	Yes
Recommended Texts	1- Textbook of Engineering Drawing Second Edition, K. Venkata Reddy 2-mechine drawing, 3rd edition, Dr. K.L.Narayana, Dr.P.Kannaiah , and K. Venkata Reddy	internet
Websites	websites & YouTube	

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks (%)**	**Definition**
Success Group (50 - 100)	**A -** Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX –** Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Applied Science**			**Module Delivery**	
Module Type	**Support**			☒ **Theory** ☒ **Lecture** ☐ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**BEM114**				
ECTS Credits	**6**				
SWL (hr/sem)	**150**				
Module Level	1		**Semester of Delivery**	1	
Administering Department	Mechanic		**College**	Enginering	
Module Leader	Hayder Abdulhasan Abbood		**e-mail**	Hayder.abood@uobasrah.edu.iq	
Module Leader's Acad. Title	Professor		**Module Leader's Qualification**	Ph.D.	
Module Tutor	Name (if available)		**e-mail**	E-mail	
Peer Reviewer Name	Name		**e-mail**	E-mail	
Scientific Committee Approval Date	1/6/2023		**Version Number**	1.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None	**Semester**	
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	The objective of the Applied Science is to acquaint the students with the basic phenomenon/concepts of chemistry and physics, the student face during course of their study in the industry and Engineering field. The student with the knowledge of the basic chemistry and physics , will understand and explain scientifically the various chemistry and physics related problems in the industry/engineering field. The

	student will able to understand the new developments and breakthroughs efficiently in engineering and technology. The introduction of the latest (R&D oriented) topics will make the engineering student upgraded with the new technologies. 1. To appreciate the need and importance of engineering chemistry and physics for industrial and domestic use. 2. To gain the knowledge on existing and future upcoming materials used in device fabrication. 3. To impart basic knowledge related to material selection and the techniques for material analysis. 4. To impart knowledge of green chemical technology and its applications. 5. To provide an insight into latest (R&D oriented) topics, to enable the engineering student upgrade the existing technologies and pursue further research. 6. To enhance the thinking capabilities in line with the modern trends in engineering and technology.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	After the completion of the course, the learner will be able to: **A part 1** A1-Understand the causes of corrosion, its consequences and methods to minimize corrosion to improve industrial designs. A2- Equipped with basic knowledge of polymer reinforced composites, applications of semiconductor photochemistry in energy harnessing and optical sensors. A3- Understand the principle of nuclear reactions. A4-Acquire Basic knowledge of Nanochemistry to appreciate its applications in the field of Medicine, data storage devices and electronics. **B PART 2** B1. Understand the constraints facing the engineer in making the right decision B2. Basic Mathematics and Science B3. Techniques used B4- physics ideas and concepts
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. Physics Units & Numbers, One-Dimensional Kinematics, Free Fall 2D Motion, , Newton's Laws of Motion, Friction, Work, Kinetic Static Fluids Buoyant Forces, Bernouli.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	1- Explanation and clarification through lectures. 2- Display scientific materials with projectors: data show, smart boards, plasma screens. 3- Self-learning through homework and mini-projects within the lectures. 4- Laboratories.

	5- Graduation projects. 6- Scientific visits. 7- Seminars held in the department. 8- Summer training. Assessment methods 1- Short exams (Quiz). 2- Homework. 3- Semester and final exams for theoretical and practical subjects. 4- Small projects within the lesson. 5- Interaction within the lecture. 6- Reports.

Student Workload (SWL)

الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	92	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	6
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	58	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	3.8
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	150		

Module Evaluation

تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	2	10% (10)	5, 10	LO #1, 2, 10 and 11
	Assignments	2	10% (10)	2, 12	LO # 3, 4, 6 and 7
	Projects	1	10% (10)	Continuous	All
	Report	1	10% (10)	13	LO # 5, 8 and 10
Summative assessment	**Midterm Exam**	2 hr	10% (10)	7	LO # 1-7
	Final Exam	2 hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	Atomic structure and octet theorem, valance bond theory and Molecular orbital theory
Week 2	Corrosion and its causes+ Potential electrodes and electrochemical cells

Week 3	Types of corrosion cells ,Corrosion treatment methods Cathodic and Anodic protection
Week 4	Types of polymers and methods of polymerization and Chemical
Week 5	mechanical properties of polymers +Polymer manufacturing methods
Week 6	Types of cement and its applications Chemical composition and Mechanical properties and cement industry
Week 7	Nuclear reactions and their types
Week 8	Nanochemistry
Week 9	Physics Units & Numbers one One-Dimensional Kinematics, Free Fall
Week 10	2D Motion, Projectiles , Newton's Laws of Motion
Week 11	Frictionamd Work, Kinetic and Potential Energy
Week 12	Static Fluids , Buoyant Forces, Bernouli Mid-term Exam + Conservation of Mechanical Energy
Week 13	Ideal Gases and Kinetic Theory, Heat: Temperature Changes
Week 14	Thermodynamics Vibrations; Simple Harmonic Motion
Week 15	Wave properties of light
Week 16	Sound, Intensity and Level **Preparatory week before the final Exam**

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	- Engineering Chemistry: Fundamentals and Applications, Cambridge University Press; 2 edition (2019) -Halliday & Resnick & Walker, Fundamental of Physics,10th edition.	Yes
Recommended Texts	- Bharathi Kumari, “Engineering Chemistry”, VGS Book .Links, 10th Edition, 2018 -Raymond A. Serway, John W. Jewett, Jr. , PHYSICS for Scientists and Engineers with Modern Physics,7 th edition.	No
Websites	https://www.jove.com/education/chem https://www.physicsclassroom.com	

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks (%)**	**Definition**
Success Group (50 - 100)	**A -** Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX –** Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Computer Programming**			**Module Delivery**	
Module Type	Support			☒ **Theory** ☒ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	BEM115				
ECTS Credits	**6**				
SWL (hr/sem)	**150**				
Module Level	1		**Semester of Delivery**	1	
Administering Department	Type Dept. Code		**College**	Type College Code	
Module Leader	Zainab Karim Radhi		**e-mail**	Zainab.radhi@uobasrah.edu.iq	
Module Leader's Acad. Title	Lecturer		**Module Leader's Qualification**	MSc	
Module Tutor	Zainab Karim Radhi		**e-mail**	Zainab.radhi@uobasrah.edu.iq	
Peer Reviewer Name	Name		**e-mail**	E-mail	
Scientific Committee Approval Date	01/06/2023		**Version Number**	1.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None	**Semester**	
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	The theoretical foundations of computer engineering have expanded substantially in recent years. The objective of this course is to introduce students to this fundamental area of computer science which enables students to focus on the study of programming languages. These languages allow the students to assess what could be achieved through computing when they are using it to solve problems in science and engineering. The course exposes students to the programming with C++, as well as to its usage for problem solving. The course introduces basic programming instructions and their properties, and the necessary mathematical libraries to develop different software applications. Upon completion of this course the students are expected to become proficient in key topics of C++ programming, and to have the opportunity to explore the current topics in this area.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Clarify the basic concepts of programming in C++ through a set of programming instructions. 2. Gain skills in handling programming problems and issues. 3. Acquiring basic skills as an introduction to building large and applied programs. 4. Gain a basic understanding of how programmed systems work in various industrial applications. 5. Ability to program and design application programs. 6. The ability to think about addressing a particular problem or issue. 7. Writing scientific reports. 8. The ability to gain experience in dealing with programmed systems.
Indicative Contents المحتويات الإرشادية	1. Readings, self-learning, panel discussions. 2. Exercises and activities in the lecture. 3. Homework. 4. Directing students to some websites to benefit and develop capabilities. 5. Conducting seminars to explain and analyze a specific issue and find solutions to it.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	1. Explanation and clarification through lectures. 2. The method of displaying scientific materials on display devices: data show, smart boards, and plasma screens. 3. Self-learning through homework and mini-projects within the lectures. 4. Laboratories. 5. Graduation projects. 6. Scientific visits. 7. Seminars held in the department. 8. Summer training

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	92	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	6
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	58	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	3.6
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	150		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	2	10% (10)	5, 10	LO #1, 2, 10 and 11
	Assignments	2	10% (10)	2, 12	LO # 3, 4, 6 and 7
	Projects / Lab.	1	10% (10)	Continuous	All
	Report	1	10% (10)	13	LO # 5, 8 and 10
Summative assessment	**Midterm Exam**	2 hr	10% (10)	7	LO # 1-7
	Final Exam	2 hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Introduction-Algorithms-Example of Algorithms
Week 2	Flowcharts-Symbols and Idiomatic Forms in Flowcharts- Types of Flowcharts
Week 3	Completing the topic of Flowcharts type-Example of Flowcharts
Week 4	Basics of programming in C++ language program parts- language components (language codes, special words, variables)
Week 5	Office functions, types of variables, logical expressions
Week 6	Arithmetic tools- priority of arithmetic and logical operations- illustrative examples
Week 7	Input and output order- Directing characters- Formatted console for input and output operations

Week 8	Completing the Formatted console for input and output operations- illustrative examples
Week 9	Conditional Statements (if statement- if-else statement-if-else-if statement-Compound if)
Week 10	Conditional Statements (switch statement-Conditional Ternary Operator- illustrative examples)
Week 11	Loop Statements (for-statement, while-statement- do-while statement-illustrative examples)
Week 12	Loop Statements (Nested Loop Statements- illustrative examples)
Week 13	One-Dimensional Arrays-illustrative examples
Week 14	Two- Dimensional Arrays- Operations on Arrays
Week 15	Completing the topic of operations on Arrays-illustrative examples
Week 16	**Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: Steps to create, compile and implement a program using Microsoft visual C++ 6.0
Week 2	Lab 2: Implement programs for conditional statements (if-statement)
Week 3	Lab 3: Implement programs for conditional statements (switch-statement)
Week 4	Lab 4: Implement programs for Loop statements (for-statement)
Week 5	Lab 5: Implement programs for conditional statements (while-statement, do-while-statement)
Week 6	Lab 6: Implement programs for Array (one dimension)
Week 7	Lab 7: Implement programs for Array (two-dimension)

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts		
Recommended Texts	أسس نفسك في البرمجة بأستخدام لغة C++	No
Websites		

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks (%)**	**Definition**
Success Group (50 - 100)	**A -** Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX –** Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Academic English Language**			**Module Delivery**	
Module Type	**Basic**			☒ **Theory** ☒ **Lecture** ☐ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**BEM116**				
ECTS Credits	**3**				
SWL (hr/sem)	**75**				
Module Level	1		**Semester of Delivery**	1	
Administering Department	Type Dept. Code		**College**	Type College Code	
Module Leader	Ameen Ahmed Nassar		**e-mail**	Ameen.nassar@uobasrah.edu.iq	
Module Leader's Acad. Title	Professor		**Module Leader's Qualification**	Ph.D.	
Module Tutor	Name (if available)		**e-mail**	E-mail	
Peer Reviewer Name	Name		**e-mail**	E-mail	
Scientific Committee Approval Date	01/06/2023		**Version Number**	1.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None	**Semester**	
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	1. To develop understanding of English Language 2. To understand Grammar of the English Language 3. This course deals with the basic concept of English Language.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Recognize how Grammar of English Language work. 2. List the various terms associated with English Language. 3. Summarize what is meant by Technical English. .
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. Nouns, Pronouns, Adjectives, Determiners, Verb & Tenses, Auxiliary Verbs, Verbs and Adverbs Phrases, Preposition and Prepoitional Phrases, Conjunctions, Sentenses, Direct and Indirect Speech, Punicutios, Presents Continous for Future Use, Linking words, Tips for Learning Irregular Verbs, [30 hrs]

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials and by considering type of simple conversations involving some sampling activities that are interesting to the students.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	44	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	3
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	31	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	2
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	30		

Module Evaluation

تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	10% (10)	5, 10	LO #1, 2, 10 and 11
	Assignments	2	10% (10)	2, 12	LO # 3, 4, 6 and 7
	Projects / Lab.	1	10% (10)	Continuous	All
	Report	1	10% (10)	13	LO # 5, 8 and 10
Summative assessment	Midterm Exam	2 hr	10% (10)	7	LO # 1-7
	Final Exam	2 hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	Nouns
Week 2	Pronouns
Week 3	Adjectives
Week 4	Determiners
Week 5	Verbs & Tenses
Week 6	Auxiliary Verbs
Week 7	Adverbs and Adverbs Phrases
Week 8	*Prepositions and Prepositional Phrases*
Week 9	*Conjunctions*
Week 10	*Sentences*
Week 11	*Direct and Indirect Speech*
Week 12	*Punctuation*
Week 13	Presents Continous for Future Use
Week 14	Linking words
Week 15	Tips for Learning Irregular Verbs
Week 16	**Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

	Material Covered

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Basic English Grammar, Book 2, SADDLEBACK,.	Yes
Recommended Texts	Free English Grammar, Level 2, Ebook.	yes
Websites	Available online.	

Grading Scheme

مخطط الدرجات

Group	Grade	التقدير	Marks (%)	Definition
Success Group (50 - 100)	**A** - Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX** – Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Mathematics II**			**Module Delivery**	
Module Type	**Basic**			☒ **Theory** ☒ **Lecture** ☐ **Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**BEM121**				
ECTS Credits	**5**				
SWL (hr/sem)	**125**				
Module Level	1		**Semester of Delivery**	2	
Administering Department	Type Dept. Code		**College**	Type College Code	
Module Leader	Mohammed Bakir Mohsen		**e-mail**	mohammed.mohsen@uobasrah.edu.iq	
Module Leader's Acad. Title	Lecture		**Module Leader's Qualification**	Ph.D.	
Module Tutor	Name (if available)		**e-mail**	E-mail	
Peer Reviewer Name	Name		**e-mail**	E-mail	
Scientific Committee Approval Date	01/06/2023		**Version Number**	1.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None	**Semester**	
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	The primary goal of this course is to teach the students many things they need to know about the use mathematical techniques to solve problems of different types of functions, use of direct integration and differentiation by many kinds of techniques. A review of fundamental mathematical methods and calculus of a different types of functions, derivatives of function, techniques of integrations. In Cartesian and polar coordinates. From general information, formulate a mathematical model. Students should also be able to validate results and draw conclusions. That will allow students to understand and solve problems that come up in the applied sciences.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1- Clarify the fundamental concepts of mathematics, science, and engineering and their applications in social and industrial fields. 2- Acquiring skills to design an integrated system and its various components and processes, within realistic economic, environment, social, political, ethical, health and safety, manufacturability, and sustainability constraints. 3 - The ability to identify and analyze engineering problem and to apply the fundamental mathematics, science, and engineering concepts to solve it. 4- an ability to outline and conduct experiments as well as analyze and interpret data. 5 - an understanding of the responsibility of engineers to practice in a professional and ethical manner at all times. 6-Use mathematical techniques to solve problems of different types of functions. 7-Use of direct integration and differentiation by many kinds of techniques. 8-From general information, formulate a mathematical model. Students should also be able to validate results and draw conclusions. 9. Writing scientific reports.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. 1- **Applications of Integration :** Area Between two curves, The Volume by using the Disk Method, The Volume by using Washer method, Volumes by Cylindrical Shells, Solids with Known Cross Sections, Lengths of Plane Curves, Areas of Surfaces of Revolution. [20 hrs] 2- **Integration Techniques:** Basic Integration Formulas, Integration by Parts, Trigonometric Integrals, Trigonometric Substitutions, Integration of Rational Functions by Partial Fractions. [24 hrs] 3- **Numerical Integration :** The Trapezoidal Rule, The Simpson's Rule. [8 hrs] 4- **Polar Coordinate :** Graphing in Polar Coordinates, Areas and Lengths in Polar Coordinates. [8 hrs]

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	• Reading and self-learning. • Training and activities during lecture.

	• HomeWorks. • Suggesting some websites for extra reading. Discussions and workshops.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	77	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	5
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	48	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	3.2
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	125		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	2	10% (10)	5, 10	LO #1, 2, 10 and 11
	Assignments	2	10% (10)	2, 12	LO # 3, 4, 6 and 7
	Projects / Lab.	1	10% (10)	Continuous	All
	Report	1	10% (10)	13	LO # 5, 8 and 10
Summative assessment	**Midterm Exam**	2 hr	10% (10)	7	LO # 1-7
	Final Exam	2 hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Area Between two curves, The Volume by using the Disk Method,
Week 2	The Volume by using Washer method, Volumes by Cylindrical Shells
Week 3	Solids with Known Cross Sections,
Week 4	Lengths of Plane Curves
Week 5	Areas of Surfaces of Revolution.

Week 6	Basic Integration Formulas
Week 7	Integration by Parts
Week 8	Trigonometric Integrals,
Week 9	Trigonometric Substitutions
Week 10	Trigonometric Substitutions
Week 11	Integration of Rational Functions by Partial Fractions.
Week 12	The Trapezoidal Rule.
Week 13	The Simpson's Rule.
Week 14	Graphing in Polar Coordinates
Week 15	Areas and Lengths in Polar Coordinates.

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Thomas' Calculus I Maurice D. Weir, Joel Hass, George B. Thomas.-12th ed.	Yes
Recommended Texts	Advanced Engineering Mathematics, By Erwin Kreyszig, 1999, John Wiley & Sons, Inc	Yes
Websites		

Grading Scheme
مخطط الدرجات

Group	Grade	التقدير	Marks (%)	Definition
Success Group (50 - 100)	**A -** Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX –** Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Engineering Mechanics Dynamics**			**Module Delivery**	
Module Type	**C**			☒ **Theory** ☒ **Lecture** ☐ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**ME122/2nd semester**				
ECTS Credits	**6**				
SWL (hr/sem)	**150**				
Module Level	1		**Semester of Delivery**	2	
Administering Department	Type Dept. Code		**College**	Type College Code	
Module Leader	Name D. Raad Jamal Jassim		**e-mail**	Raad.jassim@uobasra.edu.iq	
Module Leader's Acad. Title	Assistant Prof.		**Module Leader's Qualification**		
Module Tutor	M.Sc. Huda Abdullah Abdulkareem		**e-mail**	Huda.alkareem@uobasra.edu.iq	
Peer Reviewer Name	Name		**e-mail**		
Scientific Committee Approval Date	16/06/2023		**Version Number**	1.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None	**Semester**	
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	The theoretical foundations of *Engineering Mechanics Dynamic ha*ve expanded substantially in recent years. The objective of this course is to introduce students to this fundamental area of *Engineering Mechanics Dynamic* which enables students to focus on the Kinematics of Particles. The course exposes students to the knowing POSITION, VELOCITY, AND ACCELERATION as well as determination of motion of particles, motion of several particles and Dependent Motions. The course introduces basic of Newton's Second Law in Rectangular Components and Tangential and Normal Components and Energy and Momentum Methods and PRINCIPLE OF WORK AND ENERGY, POTENTIAL ENERGY, CONSERVATION OF ENERGY. Upon completion of this course the students are expected to become proficient in *Engineering Mechanics Dynamic*, and to have the opportunity to explore the current topics in this area.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	A- Knowledge and Understanding A1- Clarify the basic concepts of kinetic mechanics. A2- Acquisition of problem-solving skills. A3 - Acquisition of basic skills as an introduction to kinetic mechanics and intertwined in practical applications. A4- Gain a basic understanding of how kinetic mechanics is linked in various industrial applications
Indicative Contents المحتويات الإرشادية	B. Subject-specific skills B - Skills objectives of the course. B1 - The ability to analyze the problem and write the steps for the solution in a simpler way. B2 - The ability to think about addressing a particular problem or issue. B3 - Writing scientific reports. B4 - The ability to gain experience in dealing with complex mechanical systems. .

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	• Readings, self-learning, panel discussions. • Exercises and activities in the lecture. • Homework. • Directing students to some websites to benefit and develop capabilities. • Conducting seminars to explain and analyze a specific issue and find solutions to it.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	92	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	5
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	58	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	6
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	150		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	2	10% (10)	5, 10	LO #1, 2, 10 and 11
	Assignments	2	10% (10)	2, 12	LO # 3, 4, 6 and 7
	Projects / Lab.	1	10% (10)	Continuous	All
	Report	1	10% (10)	13	LO # 5, 8 and 10
Summative assessment	**Midterm Exam**	2 hr	10% (10)	7	LO # 1-7
	Final Exam	2 hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Introduction - Rectilinear motion of particle
Week 2	Determination of motion of particle
Week 3	Motion of several particles
Week 4	Dependent motion
Week 5	In the case of the motion projectile /Rectangular components of velocity and acceleration
Week 6	Tangential and normal components
Week 7	Introduction to Kinetics of particles
Week 8	Newton's Second law Equations of motion
Week 9	Rectangular components

Week 10	Work of a force , Energy and momentum methods
Week 11	Applications of the principle of work and energy
Week 12	Potential energy
Week 13	Direct and oblique central impact
Week 14	Kinematics of rigid bodies
Week 15	Acceleration in plain motion
Week 16	**Preparatory week before the final Exam**

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Engineering mechanics Dynamics R.C.HIBBELER	NO
Recommended Texts	VECTOR MECHANICS FOR ENGINEERING BEER/JOHNSTION/MAZUREK/EISENBERG	YES
Websites	https://www.coursera.org/browse/physical-science-and-engineering/mechanical-engineering	

Grading Scheme
مخطط الدرجات

Group	Grade	التقدير	Marks (%)	Definition
Success Group (50 - 100)	**A -** Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX –** Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Engineering drawing**			**Module Delivery**	
Module Type	**Support**			☒ **Theory** ☒ **Lecture** ☐ **Lab** ☐ **Tutorial** ☒ **Practical** ☐ **Seminar**	
Module Code	**BEM123**				
ECTS Credits	**4**				
SWL (hr/sem)	**100**				
Module Level	1		**Semester of Delivery**	2	
Administering Department	Type Dept. Code		**College**	Type College Code	
Module Leader	Sana Mahdi Shrama		**e-mail**	sana.mahdi@uobasrah.edu.iq	
Module Leader's Acad. Title	Professor		**Module Leader's Qualification**	Ph.D.	
Module Tutor	Name (if available)		**e-mail**	E-mail	
Peer Reviewer Name	Name		**e-mail**	E-mail	
Scientific Committee Approval Date	01/06/2023		**Version Number**	1.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None	**Semester**	
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	1. Preparing and qualifying specialized engineers to meet the requirements of the labor market in the private and public sectors in mechanical engineering through diversifying the methods of learning and teaching and training students to apply the acquired knowledge and skills to solve real problems. 2. Providing distinguished academic programs in the field of mechanical engineering, both theoretical and practical, and international rules of academic quality that meet the needs of the labor market. 3. Encouraging and developing scientific research in the fields of mechanical engineering. 4. Preparing a stimulating environment for faculty members to develop their knowledge and educational and research skills
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	A. Knowledge and Understanding A1. Clarify the basic concepts of engineering drawing and the use of AutoCAD in social and industrial fields A2. Acquire the skills to solve the problems. B. Subject-specific skills B1 - The ability to design in the completion of work B2 - The ability to think about the visualization of shapes according to the topics related to the drawing B 3 - The purpose of the engineering drawing is to be used as a guide for the manufacture or implementation of the drawn shape.
Indicative Contents المحتويات الإرشادية	• Readings, self-learning, panel discussions. • Exercises and activities in the lecture. • Homework. • Directing students to some websites to benefit and develop capabilities. • Conducting seminars to explain and analyze a specific issue and find solutions to it.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	1. Explanation and clarification through lectures. 2. The method of displaying scientific materials on display devices: data show, smart boards, and plasma screens. 3. Self-learning through homework and mini-projects within the lectures. 4. Halls of application for engineering drawing 5. Graduation projects. 6. Summer training through the application in the design department

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	62	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	38	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	2.5
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	100		

Module Evaluation
تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	2	10% (10)	5, 10	LO #1, 2, 10 and 11
	Assignments	2	10% (10)	2, 12	LO # 3, 4, 6 and 7
	Projects / Lab.	1	10% (10)	Continuous	All
	Report	1	10% (10)	13	LO # 5, 8 and 10
Summative assessment	**Midterm Exam**	2 hr	10% (10)	7	LO # 1-7
	Final Exam	2hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري الكورس الثاني

	Material Covered
Week 1	sections + duties
Week 2	sections + duties
Week 3	sections + duties
Week 4	sections +dimensions+ duties
Week 5	sections +dimensions+ duties
Week 6	sections +dimensions+ duties
Week 7	
Week 8	Mid-term Exam + Drawing projections + duties
Week 9	Pictorial drawing +Duties

Week 10	Pictorial drawing +Duties
Week 11	Pictorial drawing +Duties
Week 12	Pictorial drawing +Duties
Week 13	Pictorial drawing +dimensions+ Duties
Week 14	Pictorial drawing +dimensions+ Duties
Week 15	Pictorial drawing +dimensions+ Duties
Week 16	**Preparatory week before the final Exam**

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	الرسم الهندسي / عبد الرسول الخفاف	Yes
Recommended Texts	1- Textbook of Engineering Drawing Second Edition, K. Venkata Reddy 2-mechine drawing, 3rd edition, Dr. K.L.Narayana, Dr.P.Kannaiah , and K. Venkata Reddy	internet
Websites	websites & YouTube	

Grading Scheme
مخطط الدرجات

Group	Grade	التقدير	Marks (%)	Definition
Success Group (50 - 100)	**A** - Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX** – Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Electrical Engineering**			**Module Delivery**	
Module Type	**Support**			☒ **Theory** ☒ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**BEM124**				
ECTS Credits	**7**				
SWL (hr/sem)	**175**				
Module Level	1		**Semester of Delivery**	2	
Administering Department	Mechanical Engineering		**College**	Engineering	
Module Leader	Alaa Jasim Majid		**e-mail**	alaa.jasim@uobasrah.edu.iq	
Module Leader's Acad. Title	Assistant Lecturer		**Module Leader's Qualification**	M.Sc	
Module Tutor	Name (if available)		**e-mail**	E-mail	
Peer Reviewer Name	Name		**e-mail**	E-mail	
Scientific Committee Approval Date	16/06/2023		**Version Number**	1.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None	**Semester**	
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	1. To develop problem solving skills and understanding of circuit theory through the application of techniques. 2. To understand voltage, current and power from a given circuit. 3. This course deals with the basic concept of electrical circuits. 4. This is the basic subject for all electrical and electronic circuits. 5. To understand Kirchhoff's current and voltage Laws problems. 6. To perform mesh and Nodal analysis.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Recognize how electricity works in electrical circuits. 2. List the various terms associated with electrical circuits. 3. Summarize what is meant by a basic electric circuit. 4. Discuss the reaction and involvement of atoms in electric circuits. 5. Describe electrical power, charge, and current. 6. Define Ohm's law. 7. Identify the basic circuit elements and their applications. 8. Discuss the operations of sinusoid and phasors in an electric circuit. 9. Discuss the various properties of resistors, capacitors, and inductors. 10. Explain the two Kirchoff's laws used in circuit analysis. 11. Identify the capacitor and inductor phasor relationship with respect to voltage and current.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. DC circuits – Current and voltage definitions, Passive sign convention and circuit elements, Combining resistive elements in series and parallel. Kirchhoff's laws and Ohm's law. Anatomy of a circuit, Network reduction, Introduction to mesh and nodal analysis. AC circuits – Time dependent signals, average and RMS values. energy storage elements, simple AC steady-state sinusoidal analysis. Phasor diagrams, AC circuit analysis with complex numbers. [15 hrs]

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials and by considering type of simple experiments involving some sampling activities that are interesting to the students.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	107	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	7
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	68	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	4.5
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	175		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	2	10% (10)	5, 10	LO #1, 2, 10 and 11
	Assignments	2	10% (10)	2, 12	LO # 3, 4, 6 and 7
	Projects / Lab.	1	10% (10)	Continuous	All
	Report	1	10% (10)	13	LO # 5, 8 and 10
Summative assessment	**Midterm Exam**	2 hr	10% (10)	7	LO # 1-7
	Final Exam	2hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Modern electron theorem
Week 2	SI units
Week 3	Resistance and resistivity
Week 4	Effect of temperature on resistance
Week 5	Kirchhoff's lows
Week 6	Type of DC circuits
Week 7	Sources of energy

Week 8	Maxwell’s circulating current
Week 9	Nodal analysis
Week 10	Superposition theorem
Week 11	Thevenin’s theorem
Week 12	Norton’s theorem
Week 13	Generation of AC Voltage
Week 14	Average value and effective value
Week 15	Generation of AC Voltage

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: Measurement of current, potential difference and resistance
Week 2	Lab 2: An investigation of Ohm's and Kirchhoff's laws
Week 3	Lab 3: Measurements in resistors and continuous feeding circuits
Week 4	Lab 4: Thevenin and Superposition theorem
Week 5	Lab 5: Maximum power transfer theorem
Week 6	Lab 6: Oscilloscope
Week 7	Lab 7: Resonance in alternating current circuits

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Fundamentals of Electric Circuits, C.K. Alexander and M.N.O Sadiku, McGraw-Hill Education	Yes
Recommended Texts	DC Electrical Circuit Analysis: A Practical Approach Copyright Year: 2020, dissidents.	No
Websites	https://www.coursera.org/browse/physical-science-and-engineering/electrical-engineering	

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks (%)**	**Definition**
Success Group (50 - 100)	**A -** Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX –** Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Production Engineering**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☒ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**BEM125**				
ECTS Credits	**8**				
SWL (hr/sem)	**200**				
Module Level		1	**Semester of Delivery**		2
Administering Department		Type Dept. Code	**College**	Type College Code	
Module Leader	Raheem Khazal Al-Sabur		**e-mail**	raheem.musawel@uobasrah.edu.iq	
Module Leader's Acad. Title		Asst Professor	**Module Leader's Qualification**		Ph.D.
Module Tutor	Name (if available)		**e-mail**	E-mail	
Peer Reviewer Name		Name	**e-mail**	E-mail	
Scientific Committee Approval Date		01/06/2023	**Version Number**		1.0

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None	**Semester**	
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	1. To provide an understanding of the classification, properties, and testing methods of engineering materials. 2. To explore the production processes of ferrous and non-ferrous metals, plastics, ceramics, and powder metallurgy. 3. To introduce the principles and analysis of cold and hot working processes, including rolling, extrusion, drawing, and welding technologies. 4. To familiarize students with various casting techniques and the principles of the casting sandy process.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Classify engineering materials and describe their mechanical properties. 2. Conduct destructive and non-destructive tests on engineering materials. 3. Explain the production processes of cast iron, steel, copper, aluminum, zinc, lead, tin, plastics, ceramics, and powder metallurgy. 4. Understand the principles and analyze force requirements in hot rolling, hot extrusion, and hot drawing processes. 5. Identify different welding processes and their applications. 6. Describe the types and analyze the force requirements in various hot and cold working processes. 7. Explain the principles and processes involved in various casting techniques.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. • Engineering materials included classification of engineering materials, mechanical properties of materials, destructive and non-destructive tests such as tensile test and impact test, and hardness test (8hrs) • Ferrous and non-ferrous metal production, which is covered iron ores, blast furnace, iron production, steel production, Besmer convertor, open hearth, oxygen converter, open hearth furnace, electric-arc steelmaking furnace, extraction of aluminum, copper ores, copper extraction, lead production, zinc production, tin production (20 hrs) • Plastic production, properties of plastics, structure of polymers, thermo-plastics, thermo-setting plastics, extrusion of plastic, injection molding, structural foam molding, blow molding, reaction injection molding, rotational molding, thermoforming (8hrs) • Ceramics production, ceramics classification, properties of ceramic, ceramic manufacturing equipment, main steps for ceramic manufacturing (4hrs) • Cold and hot working included metal forming, recrystallisation temperature, purpose of cold working, advantages of cold working, disadvantages of cold working, advantages of hot working, disadvantages of hot working (4hrs) • Hot working process, hot rolling, principles of rolling processes, rolling types, force analysis in rolling, hot extrusion, principles of extrusion processes,

	extrusion types, force analysis in extrusion, drawing process, types of hot drawing, wire drawing, deep drawing, tube drawing (12hrs) • Welding process, welding joints, welding positions, classification of welding processes, oxy-acetylene welding, shielded metal arc welding, gas metal arc welding, tungsten inert gas welding, submerged arc welding, resistance welding, friction welding (4hrs) • Powder metallurgy, advantages of powder metallurgy, limitations of powder metallurgy, production of metal powders, characteristic of metal powders (4hrs)

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The main strategy that will be adopted in delivering this module is to provide a comprehensive understanding of the materials and processes involved in production engineering. The goal is to engage students and foster their critical thinking skills through interactive and practical learning experiences. Here are some suitable learning and teaching strategies for the various topics: 1. Engineering Materials: • Lecture-based sessions to introduce the classification and mechanical properties of engineering materials. • Group discussions and case studies to explore real-world applications and challenges related to materials selection. • Laboratory sessions to demonstrate destructive and non-destructive tests on materials, allowing hands-on experience. 2. Ferrous Metal Production and Non-Ferrous Metal Production: • Combination of theoretical lectures and visual presentations to explain the production processes of cast iron, steel, copper, aluminum, zinc, lead, and tin. • Guest lectures or industry visits to provide practical insights and showcase real-world applications of these metal production techniques. 3. Plastic Industry and Ceramic Industry: • Lectures and multimedia presentations to cover the properties, classification, and production processes of plastics and ceramics. • Demonstrations of plastic molding and ceramic shaping techniques to provide students with a practical understanding of the manufacturing processes. 4. Cold and Hot Working, Hot Rolling, Hot Extrusion, and Drawing Process: • Interactive lectures with visual aids to explain the principles and types of cold and hot working processes, as well as the force analysis involved. • Hands-on activities, such as laboratory experiments or workshops, to

	simulate rolling, extrusion, and drawing processes, allowing students to understand the practical aspects and challenges. 5. Welding Technology: • Demonstrations of different welding processes and techniques, accompanied by explanations of their applications and advantages. • Practical sessions where students can practice welding under the supervision and guidance of experienced instructors. • Guest lectures by industry professionals to share their expertise and provide insights into the welding industry. 6. Casting and Powder Metallurgy: • Multimedia presentations and visual demonstrations to explain the different casting techniques and the principles of the casting sandy process. • Group projects or case studies where students can design and simulate casting processes for specific components. • Practical sessions or workshops to demonstrate the principles and applications of powder metallurgy, allowing students to handle and analyze powdered materials.

Student Workload (SWL)

الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	200	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	8
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	122	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	8
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	200		

Module Evaluation

تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	2	10% (10)	5, 10	LO #1, 2, 10 and 11
	Assignments	2	10% (10)	2, 12	LO # 3, 4, 6 and 7
	Projects / Lab.	1	10% (10)	Continuous	All
	Report	1	10% (10)	13	LO # 5, 8 and 10
Summative assessment	**Midterm Exam**	2 hr	10% (10)	7	LO # 1-7
	Final Exam	2hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Engineering Materials: Classification of engineering materials, Mechanical properties of materials
Week 2	Engineering Materials: Destructive and non-destructive tests
Week 3	Ferrous Metal Production: Production of cast iron
Week 4	Ferrous Metal Production: Steel production
Week 5	Non-Ferrous Metal Production: Copper metal production
Week 6	Non-Ferrous Metal Production: Aluminum metal production
Week 7	Non-Ferrous Metal Production: Zinc, lead, and tin production
Week 8	Plastic Industry: Properties and classification of plastics
Week 9	Plastic Industry: Plastics production
Week 10	Ceramic Industry: Classification of ceramics, Ceramics production
Week 11	Cold and Hot Working: Principles of cold and hot working processes
Week 12	Hot Rolling: Principles of rolling processes, Rolling types, Force analysis in rolling
Week 13	Drawing Process: Types of hot drawing, Drawing analysis
Week 14	Hot Extrusion: Types of hot extrusion, Force analysis in extrusion
Week 15	Powder Metallurgy: Principles of powder metallurgy, Powder metallurgy production Casting: Casting types, Casting sandy process
Week 16	**Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: workshop of sharper machine
Week 2	Lab 2: workshop of drilling machine
Week 3	Lab 3: workshop of lathe machine
Week 4	Lab 4: workshop types of Files Tools
Week 5	Lab 5: workshop of Plumber
Week 6	Lab 6: workshop of Milling
Week 7	Lab 7: workshop of Carpentry
Week 8	Lab 8: workshop of Casting
Week 9	Lab 9: workshop of welding

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Introduction to Basic Manufacturing Processes and Workshop Technology Book by Rajender Singh https://blogpuneet.files.wordpress.com/2013/07/introduction-to-basic-manufacturing-processes-and-workshop-technology.pdf	No
Recommended Texts		
Websites	https://www.aboutmech.com/ https://faculty.uobasrah.edu.iq/faculty/en/1660/teaching	

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks (%)**	**Definition**
Success Group (50 - 100)	**A** - Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX** – Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Engineering Mathematics I**			**Module Delivery**	
Module Type	**Support**			☒ **Theory** ☒ **Lecture** ☐ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**BEM211**				
ECTS Credits	4				
SWL (hr/sem)	**100**				
Module Level		2	**Semester of Delivery**		3
Administering Department			**College**		
Module Leader	Yahya Muhammed Ameen		**e-mail**	yahya.ameen@uobasrah.edu.iq	
Module Leader's Acad. Title		Lecturer	**Module Leader's Qualification**		Ph.D.
Module Tutor			**e-mail**		
Peer Reviewer Name			**e-mail**		
Scientific Committee Approval Date		01/06/2023	**Version Number**		1.0

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None	**Semester**	
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	The main objectives of this course is to teach the students the basics of matrices and vector analysis and their applications in mechanical engineering. The student also teaches vector analysis by studying several topics such as the basics of vectors and algebraic operations that can be performed on vectors and applying these topics in calculating vector functions such as directional derivatives, divergence and curl and thus applying them in calculating line, surface and volume integrals and then the student will be able to apply it in various topics related to mechanical engineering.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	A. Knowledge and Understanding: By the end of the course, the student will be able to: A1. Use mathematical methods to solve engineering problems. A2. Use linear algebra tools to solve systems of linear equations. A3. Use vector analysis to solve many engineering problems. B. Subject-specific skills: The ability to solve engineering problems and how to deal with them mathematically and choosing the appropriate methods for solving.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following: Unit I - Matrices Properties of matrices, matrices types, Operations on matrices determinants, inverse of matrices, solution of linear simultaneous equations. [20 hrs.] Unit II – Vector Calculus Forms of a curve equation in space, parametric equations, unit tangent vectors, curvature, radius of curvature, motion along a curve, velocity, acceleration and speed, normal and tangential components of acceleration. [12 hrs.] Unit III – Vector Valued Functions Scalars and vectors, components of a vector, rules of vector arithmetic, norm of a vector, normalizing of vectors, dot product, cross product, product of three or more vectors, equations of lines and planes in 3-space. [16 hrs.] Unit IV – Multiple Integrals Double integrals, areas and volumes, double integrals in polar coordinates, surface area. [12 hrs.]

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials and some activities that are interesting to the students.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	62	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	38	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	2.5
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	100		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	2	10% (10)	5, 10	LO #1, 2, 10 and 11
	Assignments	2	10% (10)	2, 12	LO # 3, 4, 6 and 7
	Projects	1	10% (10)	Continuous	All
	Report	1	10% (10)	13	LO # 5, 8 and 10
Summative assessment	**Midterm Exam**	2 hrs.	10% (10)	7	LO # 1-7
	Final Exam	2 hrs.	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Properties of Matrices, Types of Matrices
Week 2	Operations on Matrices (Algebra of Matrices), Partitioning of Matrices
Week 3	Determinants
Week 4	Inverse of Matrix
Week 5	Linear Equations systems
Week 6	Vectors Calculus
Week 7	Dot (or Scalar) Product
Week 8	Cross (or Vector) Product
Week 9	Lines and Planes in 3-Space
Week 10	Unit Tangent Vectors and Unit Normal Vectors
Week 11	Directional Derivative
Week 12	Divergence and Curl
Week 13	Double Integrals
Week 14	Triple Integrals
Week 15	Polar Coordinates in Double and Triple Integrals
Week 16	Preparatory week before the final Exam

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Advanced Engineering Mathematics, Dennis G. Zill, Loyola Marymount University. Sixth edition.	No
Recommended Texts	Thomas' Calculus, Maurice D. Weir, Joel Hass, George B. Thomas.-12th ed.	Yes
Websites		

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks (%)**	**Definition**
Success Group (50 - 100)	**A -** Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX –** Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	Fluid mechanics			**Module Delivery**	
Module Type	Core			☒ **Theory** ☒ **Lecture** ☒ **Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	BEM212				
ECTS Credits	9				
SWL (hr/sem)	225				
Module Level	2		**Semester of Delivery**	3	
Administering Department	Mechanical Engineering		**College**	College of Engineering	
Module Leader			**e-mail**		
Module Leader's Acad. Title			**Module Leader's Qualification**		
Module Tutor			**e-mail**		
Peer Reviewer Name			**e-mail**		
Scientific Committee Approval Date			**Version Number**		

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None	**Semester**	
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	1. Giving a preliminary idea of fluids' most important mechanical properties and introducing their laws. 2. Introducing the student to the laws of calculating forces on the surfaces of reservoirs, ships, dams, and others. 3. Preparing and qualifying specialized engineers to meet the labour market requirements in the private and public sectors in mechanical engineering. This is through diversifying learning methods and education and training students to apply the acquired knowledge and skills to solve real problems. 4. Helping the student to understand the important equations that control the movement of fluids (continuity equation, energy equation, Euler equation, Bernoulli equation) and the different applications of these equations. 5. Definition of the types of flow. 6. Definition of velocity distribution and calculation of shear stress in pipes. 7. Definition of pipe connection systems. 8. Definition of the external flow and the boundary layer.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. The learner can understand the behavior of fluids according to their properties and use them appropriately. 2. Familiarize students with different pressure measurements. 3. Enabling students to measure the level of liquids in containers. 4. The student should know the differences between different pressures and how to measure them. 5. The student should know the forces generated by fluids when they flow and how to calculate these forces. 6. Gain experience in hydraulic systems. 7. Enabling the student to derive mathematical relationships based on laboratory experiments. 8. The student should mention, for example, the properties of physical fluids. 9. The student should know the difference between the types of fluid flow. 10. To distinguish between the equations of flow and their applications. 11. The student should know the difference between static and flowing liquid.
Indicative Contents المحتويات الإرشادية	Types of fluid, law of continuum, properties of fluid, viscosity, Newton's law of viscosity, velocity profile, surface tension, cohesion & adhesion, capillarity/bulk modulus compressibility, compressibility, vaporability & vapor pressure, cavitation, specific density and specific weight, perfect gas law. [15 hr] Defining the absolute and gauge pressures, pressure direction, pressures at a point, and pressure variation with the elevation. [10 hr] Determining the resultant force acting on a submerged plane surface and the vertical

	and horizontal components on a curved submerged bodies. [15 hr] Definition of the buoyancy force and its application in floating bodies. Determining the stabilities of the floating bodies by metacentre. [10 hr] The acceleration in linear and rotational motion. [15 hr] Defining the important dimensionless numbers- The methods of collecting multi variables in a single dimensionless relation. [10 hr] Fluid in motion- Flow lines: pathline, streamline, streakline- flow visualization-The definition of control volume and basic derivatives of the equations of conservation (conservation of mass, momentum and energy)- Euler and Bernoulli equations-Applications of momentum equation of stationary and moving blades. [15 hr] Laminar and turbulent fully developed flow between parallel plates and inside pipes-Friction factor and its relations with Reynolds number and with pipe roughness-Minor losses in fittings such as valves, reduces, expanders, filters, elbows -the overall losses-Multipipes systems. [15 hr] The definition of boundary layer flow, boundary layer thickness, displacement thickness, and momentum thickness-Laminar and turbulent boundary layer over a flat plate, Von Karman theory. [15 hr]

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	1- Knowing the questions and inquiries distinguished by depth and accuracy. 2- Simulating the student towards understanding the cause and reason. 3- Increasing the digital sense of expression. 4- Intellectual development.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	137	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	9
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	88	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	5.8
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	225		

Module Evaluation

تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	10% (10)	4, 10	LO #1, 2, and 3
	Tutorials	2	10% (10)	2, 12	LO # 3, 4, 5 and 6
	Projects / Lab.	1	10% (10)	Continuous	All
	Report	1	10% (10)	13	LO # 7, 8 and 9
Summative assessment	Midterm Exam	2 hr	10% (10)	7	LO # 1-11
	Final Exam	2hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	General Introduction- Definition of Fluid
Week 2	Pressure acting on a point-Pressure variation with depth
Week 3	Forces on Immersed plane Surfaces
Week 4	Buoyancy & Stability in immerged Bodies
Week 5	Stability in floating Bodies
Week 6	Linear motion with constant acceleration
Week 7	Rotational motion with constant acceleration
Week 8	Dimensionless Analysis & Similarity
Week 9	Introduction to Fluid Motion
Week 10	Applications of Bernoulli Equation
Week 11	Viscous Flow-Entrance Length
Week 12	Laminar flow between Parallel plates & inside a circular pipe
Week 13	Major friction losses for Turbulent Flow- Losses in Noncircular conduits
Week 14	Multiple Piping Systems
Week 15	External flow- Boundary layer

Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

	Material Covered
Week 1	Lab 1: Hydrostatic pressure
Week 2	Lab 2: Flowlines visualization
Week 3	Lab 3: Verification of Bernoulli Equation
Week 4	Lab 4: Friction Losses in Smooth Pipes
Week 5	Lab 5: Flow Measurement & Energy Losses

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Fluid Mechanics" Frank. M. White, 6th edition	Yes
Recommended Texts	Fundamentals of Fluid Mechanics" 5th edition B. R. Munson et al. - John Wiley and Sons.	No
Websites	https://faculty.uobasrah.edu.iq/faculty/287/teaching	

Grading Scheme

مخطط الدرجات

Group	Grade	التقدير	Marks (%)	Definition
Success Group (50 - 100)	**A** - Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX** – Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Strength of Materials**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☒ **Lecture** ☒ **Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**BEM213**				
ECTS Credits	**9**				
SWL (hr/sem)	**225**				
Module Level	2		**Semester of Delivery**	3	
Administering Department	Type Dept. Code		**College**	Type College Code	
Module Leader	Name		**e-mail**	E-mail	
Module Leader's Acad. Title	Professor		**Module Leader's Qualification**	Ph.D.	
Module Tutor	Name (if available)		**e-mail**	E-mail	
Peer Reviewer Name	Name		**e-mail**	E-mail	
Scientific Committee Approval Date	01/06/2023		**Version Number**	1.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None	**Semester**	
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	1. This course deals with the basic concept of forces and other external stress effects and their effects on the mechanical part. This knowledge is very essential for an engineer, to enable him to design all types of structures and machines. 2. To provide the basic concepts and principles of mechanics of materials and to give the ability to analyze a given problem simply. 3. To give the ability to calculate stresses and deformations of objects under external forces. 4. To give the ability to apply the knowledge of mechanics of materials to engineering applications and design problems.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	A- Knowledge and Understanding: 1. Clarify the basic concepts of mechanics of materials. 2. Acquire skills in dealing with engineering problems and topics related to mechanical design. 3. Acquisition of basic skills as an introduction to the construction and calculations of mechanical parts and their dimensions. 4. Understand the deformations that occur in the dimensions of mechanical systems as a result of applying forces and moments. B- Subject-specific skills: 1. The ability to calculate various types of stresses. 2. The ability to think about the analysis of a mechanical part subjected to a group of external effects. 3. Writing scientific reports. 4. The ability to gain experience in dealing with mechanical parts to prepare the student for the design subject. C- General and Transferable Skills: 1. Develop the student's ability to perform the duties and deliver them on time. 2. Logical and engineering thinking to find solutions and accounts for different mechanical systems and parts. 3. Develop the student's ability in dialogue and discussion. 4. Develop the student's ability to deal with modern technology, especially the Internet.
Indicative Contents المحتويات الإرشادية	**Indicative content includes the following.** **<u>Part I – Mechanics of Materials</u>** **Simple Stress and Strain:** Types of Loads, Mechanical Properties, Stress and Strain, Direct or normal stress and Strain, Stress – Strain Curve, Poisson's Ratio, Shear stress and Strain Compound Bars. [6 hrs] **Shear Force and Bending Moment Diagrams:** Types of Loading, Types of Support, Definition and Sign Convention of Shearing Force and Bending Moment, Shearing Force and Bending Moment for Different Cases, Relationship Between Shear Force (Q),

	Bending Moment (M) and Intensity of Loading (W). [12 hrs] **Bending Stress of Beam:** Simple Theory of Bending, Neutral Axis and Section Modulus, Combined Bending and Direct Stress Eccentric loading. [6 hrs] **Shear Stress Distribution:** Distribution of shear stress due to bending, Applications on the Different Sections. [6 hrs] **Slope and Deflection of Beams:** Direct integration method (Double Integration), Macaulay's method, Mohr's "Area-Moment" Method, Continuous Beams-Clapeyron's "Three-Moment" Equation, Built in Beam (Fixed-Fixed). [12 hrs] **Part II – Strength of Materials** **Torsion:** Simple torsion theory, Polar Second Moment of Area and Polar Section Modulus Composite Shafts, Combined Stress Systems, Combined Bending and Torsion, Combined Bending, Torsion and Direct Thrust, Shafts with Bolt Coupling, Torsion of Non-Circular. [6 hrs] **Stress and Strain Analysis:** Stress Analysis, Stresses on Oblique Planes, Direct Stress, Material Subjected to Pure Shear, Material Subjected to Two Mutually Perpendicular Direct Stresses, Material subjected to combined direct and shear stresses, Principal plane inclination in terms of the associated principal stress, Graphical solution-Mohr's stress circle Strain Analysis, Linear strain for bi-and tri-axial stress state, Principal strains in terms of stresses, Bulk modulus K and Volumetric strain, Relationship between the elastic constants E, G, K and v, Strains on an oblique plane (direct and shear), Principal strain-Mohr's strain circle, Relationship between Mohr's stress and strain circles. [18 hrs] **Strain Energy:** Strain energy for different kind of loading, Suddenly applied loads, Castigliano's first theorem for deflection. [6 hrs] **Thin Cylinders and Shells:** Thin cylinders under internal pressure, Hoop or circumferential stress, Longitudinal stress, Changes in dimensions, Thin spherical shell under internal pressure, Change in internal volume, Vessels subjected to fluid pressure, Cylindrical vessel with hemispherical ends, Wire-wound thin cylinders. [6 hrs] **Thick Cylinders:** Development of the Lam6 theory, Thick cylinder - internal pressure only, Longitudinal stress, Change of cylinder dimensions, Compound cylinders. [6 hrs] **Struts:** Euler's theory, Euler "validity limit", Rankine or Rankine-Gordon formula. [6 hrs]

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The main strategy that will be adopted in delivering this module is to encourage students' participation and acquire skills dealing with engineering problems and topics related to mechanical design. In addition to developing the student's ability in dialogue and discussion and logical and engineering thinking to find solutions and accounts for different mechanical systems and parts. This will be achieved through classes, interactive tutorials, and by considering types of simple experiments involving some sampling activities that are interesting to the students.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ 15 اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	137	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	9
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	88	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	5.8
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	225		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	2	10 % (10)	5, 10	LO #1, 2, 10 and 11
	Assignments	2	10 % (10)	2, 12	LO # 3, 4, 6 and 7
	Projects / Lab.	1	10 % (10)	Continuous	All
	Report	1	10 % (10)	13	LO # 5, 8 and 10
Summative assessment	**Midterm Exam**	2 hr	10 % (10)	7	LO # 1-7
	Final Exam	2hr	50 % (50)	16	All
Total assessment			100 % (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	**Simple Stress and Strain**: Types of Loads, Mechanical Properties, Stress and Strain, Direct or normal stress and Strain, Stress – Strain Curve, Poisson's Ratio, Shear stress and Strain Compound Bars.
Week 2	**Shear Force and Bending Moment Diagrams:** Types of Loading, Types of Support, Definition and Sign Convention of Shearing Force and Bending Moment, Shearing Force and Bending Moment for Different Cases, Relationship Between Shear Force (Q), Bending Moment (M) and Intensity of Loading (W).
Week 3	
Week 4	**Bending Stress of Beam:** Simple Theory of Bending, Neutral Axis and Section Modulus, Combined Bending and Direct Stress Eccentric loading.
Week 5	**Shear Stress Distribution:** Distribution of shear stress due to bending, Applications on the Different Sections.
Week 6	**Slope and Deflection of Beams:** Direct integration method (Double Integration), Macaulay's method, Mohr's "Area-Moment" Method, Continuous Beams-Clapeyron's "Three-Moment" Equation, Built in Beam (Fixed-Fixed).
Week 7	
Week 8	**Torsion:** Simple torsion theory, Polar Second Moment of Area and Polar Section Modulus Composite Shafts, Combined Stress Systems, Combined Bending and Torsion, Combined Bending, Torsion and Direct Thrust, Shafts with Bolt Coupling, Torsion of Non-Circular.
Week 9	**Stress and Strain Analysis:** Stress Analysis, Stresses on Oblique Planes, Direct Stress, Material Subjected to Pure Shear, Material Subjected to Two Mutually Perpendicular Direct Stresses, Material subjected to combined direct and shear stresses, Principal plane inclination in terms of the associated principal stress, Graphical solution-Mohr's stress circle Strain Analysis, Linear strain for bi-and tri-axial stress state, Principal strains in terms of stresses, Bulk modulus K and Volumetric strain, Relationship between the elastic constants E, G, K and v, Strains on an oblique plane (direct and shear), Principal strain-Mohr's strain circle, Relationship between Mohr's stress and strain circles.
Week 10	
Week 11	
Week 12	**Strain Energy:** Strain energy for different kind of loading, Suddenly applied loads, Castigliano's first theorem for deflection.
Week 13	**Thin Cylinders and Shells:** Thin cylinders under internal pressure, Hoop or circumferential stress, Longitudinal stress, Changes in dimensions, Thin spherical shell under internal pressure, Change in internal volume, Vessels subjected to fluid pressure, Cylindrical vessel with hemispherical ends, Wire-wound thin cylinders.
Week 14	**Thick Cylinders:** Development of the Lam6 theory, Thick cylinder - internal pressure only, Longitudinal stress, Change of cylinder dimensions, Compound cylinders.
Week 15	**Struts:** Euler's theory, Euler "validity limit", Rankine or Rankine-Gordon formula.
Week 16	**Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	**Lab 1:** Impact Test
Week 2	**Lab 2:** Tensile Test
Week 3	**Lab 3:** Bending Test
Week 4	**Lab 4:** Torsion Test
Week 5	**Lab 5:** Curved Beam Test
Week 6	**Lab 6:** Thin Cylinder Test
Week 7	**Lab 7:** Buckling Test

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Mechanics of Materials I - E. J. Hearn	Yes
Recommended Texts	Strength of Materials - Ferdinand L. Singer and Andrew Pytel	Yes
Websites	https://www.coursera.org/browse/physical-science-and-engineering/mechanical-engineering www.mathalino.com	

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks (%)**	**Definition**
Success Group (50 - 100)	**A -** Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX –** Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Advanced Programming**			**Module Delivery**	
Module Type	**Support**			☒ **Theory** ☒ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**BEM214**				
ECTS Credits	**6**				
SWL (hr/sem)	**150**				
Module Level	2		**Semester of Delivery**	3	
Administering Department	Type Dept. Code		**College**	Type College Code	
Module Leader	RANA LATEEF		**e-mail**	rana.natush@uobasrah.edu.iq	
Module Leader's Acad. Title	Lecturer		**Module Leader's Qualification**	M.S.C	
Module Tutor	RANA LATEEF NATOOSH		**e-mail**	rana.natush@uobasrah.edu.iq	
Peer Reviewer Name	Name		**e-mail**	E-mail	
Scientific Committee Approval Date	16/06/2023		**Version Number**	1.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None	**Semester**	
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	The theoretical foundations of computer engineering have expanded substantially in recent years. The objective of this course is to introduce students to this fundamental area of computer science which enables students to focus on the study of programming languages. These languages allow the students to assess what could be achieved through computing when they are using it to solve problems in science and engineering. The course exposes students to the programming with MATLAB, as well as to its usage for problem solving. The course introduces basic programming instructions and their properties, and the necessary mathematical libraries to develop different software applications. Upon completion of this course the students are expected to become proficient in key topics of MATLAB language programming the opportunity to explore the current topics in this area
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Clarify the basic concepts of programming in MATLAB language through a set of programming instructions. 2. Gain skills in handling programming problems and issues. 3. Acquiring basic skills as an introduction to building large and applied programs. 4. Gain a basic understanding of how programmed systems work in various industrial applications. 5.Ability to program and design application programs. 6. The ability to think about addressing a particular problem or issue. 7. Writing scientific reports. 8.The ability to gain experience in dealing with programmed systems..
Indicative Contents المحتويات الإرشادية	1. Readings, self-learning, panel discussions. 2. Exercises and activities in the lecture. 3. Homework. 4. Directing students to some websites to benefit and develop capabilities. 5. Conducting seminars to explain and analyze a specific issue and find solutions to it.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	1. Explanation and clarification through lectures. 2. The method of displaying scientific materials on display devices: data show, smart boards, and plasma screens. 3. Self-learning through homework and mini-projects within the lectures.

	4. Laboratories. 5. Graduation projects. 6. Scientific visits. 7. Seminars held in the department. 8. Summer training

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	92	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	6
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	58	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	3.8
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	150		

Module Evaluation
تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	2	10% (10)	5, 10	LO #1, 2, 10 and 11
	Assignments	2	10% (10)	2, 12	LO # 3, 4, 6 and 7
	Projects / Lab.	1	10% (10)	Continuous	All
	Report	1	10% (10)	13	LO # 5, 8 and 10
Summative assessment	**Midterm Exam**	2 hr	10% (10)	7	LO # 1-7
	Final Exam	2 hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Introduction to Matlab language and writing symbols with use it
Week 2	Types of constants , variables and arithmetic sentences
Week 3	Write a simple matrix and how to address it to find any element in it
Week 4	Write a regular matrices and how to address it to find any element in it
Week 5	Standard matrices unit, zeroes and eye matrices
Week 6	operations on arrays
Week 7	Arithmetic operations between a matrix and a singular number or between matrices
Week 8	Searching for a partial matrix and using prompts to find the sum of the elements of the matrix or the largest or smallest element in it
Week 9	Input and output sentences
Week 10	Comparative and logical operators If-else-end form switch-case-otherwise form
Week 11	Rotation and repetition statements
Week 12	Formula for storing variables and for loading them from a file
Week 13	Dealing with files
Week 14	Instructing plot and partial graphs
Week 15	Greate function that deal with one or with several variables with input and one variable with output
Week 16	**Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: Steps to create, compile and implement a program using Matlab languge
Week2	Lab 2: Implement programs for Array (one and two dimensions)
Week 3	Lab 3: Implement programs for conditional statements (if-statement)
Week 4	Lab 4: Implement programs for conditional statements (switch-statement)
Week 5	Lab 5: Implement programs for Loop statements (for-statement)
Week 6	Lab 6: Implement programs for plot and partial graphs
Week 7	Lab 7: Implement programs for function that deal with one or with several variables

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts		
Recommended Texts	تعليم البرمجة بلغة ماتلاب بالأمثلة الشاملة	No
Websites		

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks (%)**	**Definition**
Success Group (50 - 100)	**A -** Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX –** Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Human Rights and Democracy**			**Module Delivery**	
Module Type	**Basic**			☐ **Theory** ☒ **Lecture** ☐ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**BEM215**				
ECTS Credits	**2**				
SWL (hr/sem)	**50**				
Module Level	2		**Semester of Delivery**	3	
Administering Department	Depart. of Mech. Eng.		**College**	College of Engineering	
Module Leader	Name		**e-mail**	E-mail	
Module Leader's Acad. Title	Lecturer		**Module Leader's Qualification**	Ph.D.	
Module Tutor	Hussian		**e-mail**	E-mail	
Peer Reviewer Name	Name		**e-mail**	E-mail	
Scientific Committee Approval Date	01/06/2023		**Version Number**	1.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None	**Semester**	
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	1. To provide an understanding of the fundamental concepts and principles of freedom and human rights. 2. To explore the different aspects of freedom, including intellectual, cultural, political, economic, and social freedoms. 3. To examine the relationship between human rights, democracy, and the Universal Declaration of Human Rights. 4. To analyze the various types of democracy and their applications. 5. To address the challenges and future prospects of public freedoms and democracy.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Understand the fundamental concepts and principles of freedom and human rights. 2. Analyze the different dimensions of freedom, including intellectual, cultural, political, economic, and social freedoms. 3. Evaluate the significance of the Universal Declaration of Human Rights in promoting human rights globally. 4. Examine the intersection of freedom and democracy, including the concept of democracy in Islam. 5. Compare and contrast different types of democracy and their practical applications. Critically analyze the challenges and opportunities related to public freedoms and democracy.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. • Introduction to Human Rights and Democracy: Overview of the course objectives and structure, Introduction to fundamental concepts of freedom and human rights, Fundamental Freedoms: Intellectual freedom and cultural freedom, Freedom in Politics: Political freedom, Overview of different political systems and their impact on human rights (6hrs) • Economic and Social Freedom: Economic freedom, Social freedom, The Future of Public Freedoms: Emerging challenges and opportunities in the context of public freedoms, Universal Declaration of Human Rights and Freedoms: Overview of the Universal Declaration of Human Rights and its significance, Freedom in Islam: Examination of the concept of freedom in Islamic teachings (6hrs) • Types of Democracy: Introduction to different types of democracy, Democracy and its Application: Analysis of the practical implementation of democracy in various contexts, Administrative and Financial Corruption: Examination of the impact of corruption on human rights and democracy, Democracy in Islam: Exploration of the concept of democracy within Islamic

	principles (8 hrs) • Challenges to Democracy: Analysis of the challenges faced by democratic systems, Protection of Human Rights:, Strategies and mechanisms for the protection of human rights, Democratic Governance: Understanding the principles and practices of democratic governance, Conclusion and Future Perspectives: Review of key concepts and discussions on the future prospects of human rights and democracy(8hrs)

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Here are some suitable learning and teaching strategies for the course "Human Rights and Democracy": Lectures: Conduct engaging lectures to introduce and explain the fundamental concepts of freedom, human rights, and democracy. Use multimedia resources, case studies, and real-life examples to illustrate the practical applications and challenges related to human rights and democracy. Encourage student participation through interactive discussions, questions, and debates to promote critical thinking and deeper understanding of the topics. Group Discussions and Debates: Organize group discussions and debates to encourage students to critically analyze and evaluate different perspectives on human rights and democrcy

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	32	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	18	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	1.2
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	50		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	2	10% (10)	5, 10	LO #1, 2, 10 and 11
	Assignments	2	10% (10)	2, 12	LO # 3, 4, 6 and 7

	Projects / Lab.	1	10% (10)	Continuous	All
	Report	1	10% (10)	13	LO # 5, 8 and 10
Summative assessment	**Midterm Exam**	2 hr	10% (10)	7	LO # 1-7
	Final Exam	2 hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	Introduction to Human Rights and Democracy: • Overview of the course objectives and structure • Introduction to fundamental concepts of freedom and human rights
Week 2	Fundamental Freedoms: • Intellectual freedom and cultural freedom
Week 3	Freedom in Politics: • Political freedom • Overview of different political systems and their impact on human rights
Week 4	Economic and Social Freedom: • Economic freedom • Social freedom
Week 5	The Future of Public Freedoms: • Emerging challenges and opportunities in the context of public freedoms
Week 6	Universal Declaration of Human Rights and Freedoms: • Overview of the Universal Declaration of Human Rights and its significance
Week 7	Freedom in Islam: • Examination of the concept of freedom in Islamic teachings

Week 8	Types of Democracy: • Introduction to different types of democracy
Week 9	Democracy and its Application: • Analysis of the practical implementation of democracy in various contexts
Week 10	Administrative and Financial Corruption: • Examination of the impact of corruption on human rights and democracy
Week 11	Democracy in Islam: • Exploration of the concept of democracy within Islamic principles
Week 12	Challenges to Democracy: • Analysis of the challenges faced by democratic systems
Week 13	Protection of Human Rights: • Strategies and mechanisms for the protection of human rights
Week 14	Democratic Governance: • Understanding the principles and practices of democratic governance
Week 15	Conclusion and Future Perspectives: • Review of key concepts and discussions on the prospects of human rights and democracy
Week 16	**Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	
Week 2	
Week 3	
Week 4	

Week 5	
Week 6	
Week 7	

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	"Human Rights: Politics and Practice" by Michael Goodhart	No
Recommended Texts		
Websites	https://www.ohchr.org/en/ohchr_homepage	

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks (%)**	**Definition**
Success Group (50 - 100)	**A -** Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX –** Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

Module Information معلومات المادة الدراسية					
Module Title	**Engineering Mathematics II**			**Module Delivery**	
Module Type	**Support**			☒ **Theory** ☒ **Lecture** ☐ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**BEM221**				
ECTS Credits	4				
SWL (hr/sem)	**100**				
Module Level	2		**Semester of Delivery**	4	
Administering Department			**College**		
Module Leader	Yahya Muhammed Ameen		**e-mail**	yahya.ameen@uobasrah.edu.iq	
Module Leader's Acad. Title	Lecturer		**Module Leader's Qualification**	Ph.D.	
Module Tutor			**e-mail**		
Peer Reviewer Name			**e-mail**		
Scientific Committee Approval Date	01/06/2023		**Version Number**	1.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None	**Semester**	
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	In this course the student teaches different methods (including Laplace transformation) to solve ordinary deferential equations. The fundamentals of series and sequences also will be provided.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	A. Knowledge and Understanding: By the end of the course the student will be able to: A1. Use different mathematical methods to solve ordinary differential equations (and then many engineering problems). B. Subject-specific skills:

	The ability to solve engineering problems and how to deal with them mathematically and choosing the appropriate methods for solving.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following: Unit I : DIFFERENTIAL EQUATIONS (i) First-Order DEs: Fundamental definitions. Solutions of First-Order DEs. Separation of variables. Exact, linear, and Bernoulli equations. (ii) Second and higher Order DEs: D-operator. Linear equation with constant coefficients. Linear homogeneous equations with constant coefficients. Non-homogenous equations. Solving of non-homogenous equations: Undetermined coefficients and variation of parameters methods. Higher-order linear equations with constant coefficients, Cauchy equation. [28 hrs.] Unit II: LAPLACE TRANSFORMATION Definition and basic properties of the Laplace Transformation. The Laplace Transformation of elementary functions. The Laplace Transform of e^{at} f (t), and $t^n f$ (*t*). Inverse Laplace transforms. Solution of differential equations using Laplace Transforms. [20 hrs.] Unit III: INFINITE SEQUENCES AND SERIES Introduction. Convergence and Divergence Tests. Geometric series and partial sum. Integral. Comparison, ratio and root tests. Alternating series. Power Series. Taylor and Maclaurin series. Applications of power series. [12 hrs.]

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials and some activities that are interesting to the students.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	62	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	38	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	2.5
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	100		

Module Evaluation

تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	2	10% (10)	5, 10	LO #1, 2, 10 and 11
	Assignments	2	10% (10)	2, 12	LO # 3, 4, 6 and 7
	Projects	1	10% (10)	Continuous	All
	Report	1	10% (10)	13	LO # 5, 8 and 10
Summative assessment	**Midterm Exam**	2 hrs.	10% (10)	7	LO # 1-7
	Final Exam	2hrs.	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	Fundamental Definitions. Solution of a Differential Equation (DE). Solutions of The First-Order DEs: 1- Separation of Variable in First-Order DEs.
Week 2	2- Homogeneous First-Order DEs. 3- Exact First-Order DEs and Integrating Factors.
Week 3	4- Linear DEs and Bernoulli Equation.
Week 4	Solutions of The Second-Order DEs: 1- Second-Order Differential Equations Reducible to First-Order.
Week 5	2- Second-Order Homogeneous Linear DEs. 3- Second-Order Nonhomogeneous Linear DEs.
Week 6	Particular Solution Methods: 1- Undetermined Coefficients. 2- Variations of Parameters.
Week 7	Solutions of The Higher-Order DEs: 1- Higher-Order Homogeneous Linear DEs. 2- Higher-Order Nonhomogeneous Linear DEs.
Week 8	Definition and basic properties of the Laplace Transformation.
Week 9	The Laplace Transformation of elementary functions. The Laplace Transform of $e^{at} f(t)$.

Week 10	The Laplace Transform of $t^n f(t)$. Inverse Laplace transforms. Properties of inverse Laplace Transform.
Week 11	Inverse Laplace Transforms using partial fractions.
Week 12	Solution of DEs using Laplace Transforms.
Week 13	Introduction to sequences. Convergence and divergence.
Week 14	Infinite series. Converges and diverges tests of infinite series.
Week 15	Power series. Taylor and Maclaurin series.
Week 16	Preparatory week before the final Exam.

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Advanced Engineering Mathematics, Dennis G. Zill, Loyola Marymount University. Sixth edition.	No
Recommended Texts	Thomas' Calculus, Maurice D. Weir, Joel Hass, George B. Thomas.-12th ed.	Yes
Websites		

Grading Scheme
مخطط الدرجات

Group	Grade	التقدير	Marks (%)	Definition
Success Group (50 - 100)	**A -** Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX –** Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Thermodynamics**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☒ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**BEM222**				
ECTS Credits	**8**				
SWL (hr/sem)	**200**				
Module Level	2		**Semester of Delivery**	4	
Administering Department	BEM		**College**	BEM	
Module Leader	Mohammed K Kadhim		**e-mail**	E-mail mohameed.kado@uobasrah.edu.iq	
Module Leader's Acad. Title	Asst Professor		**Module Leader's Qualification**	Ph.D.	
Module Tutor	Name (if available)		**e-mail**	E-mail	
Peer Reviewer Name	Name		**e-mail**	E-mail	
Scientific Committee Approval Date	01/06/2023		**Version Number**	1.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None	**Semester**	
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	In this Module, the study of thermodynamics concepts, principles and analysis techniques is made relatively easy for the reader by inclusion of most of the reference data, in form of excerpts, within the discussion of each case study, exercise and self-assessment problem solutions. This is in an effort to facilitate quick study and comprehension of the material without repetitive search for reference data in other.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Better understanding of thermodynamics terms, concepts, principles, laws, analysis methods, solution strategies and computational techniques. 2. Greater confidence in interactions with thermodynamics design engineers and thermodynamics experts. Summarize what is meant by the Thermodynamics. 3. Skills and preparation necessary for succeeding in thermodynamics portion of various certification and licensure exams, i.e. CEM, FE, PE, and many other trade certification tests. Describe power, heat, and vapor. 4. A better understanding of the thermodynamics component of heat related energy projects. 5. A compact and simplified thermodynamics desk reference.
Indicative Contents المحتويات الإرشادية	Content includes the following. <u>Part A</u> Phases of Water and Associated Thermodynamics [10 hrs] Thermodynamics I [12 hrs] THE WORKING FLUID. [10 hrs] Reversible Processes (Non-Flow & Steady Flow). [10 hrs] THERMODYNAMIC II [12 hrs] Revision problem classes [5 hrs] <u>Part B -</u> The heat engine Cycles. [12 hrs] The Simple Rankin Cycle. [8 hrs] Positive Displacement Compressors Reciprocating Machines

	The Conditions For Minimum Work Isothermal Efficiency & Volumetric Efficiency Multi – Stage Compression. [12 hrs] Mixtures Dalton's Law and Gibbs – Dalton Law Volumetric Analysis of a Gas Mixture Molecular Weight Gas Constant and Specific Heat of Gas Mixture Adiabatic Mixing of Gas Mixture[10 hrs]

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Certain thermodynamic concepts and terms explain more than once as these concepts appear in different segments of this text; often with a slightly different perspective. This approach is a deliberate attempt to make the study of some of the more abstract thermodynamics topics more fluid; allowing the reader continuity, and precluding the need for pausing and referring to segments where those specific topics were first introduced.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	122	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	8
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	78	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	5.2
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	200		

Module Evaluation

تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	10% (10)	4, 10	LO #1, 2, and 3
	Tutorials	2	10% (10)	2, 12	LO # 3, 4, 5 and 6
	Projects / Lab.	1	10% (10)	Continuous	All
	Report	1	10% (10)	13	LO # 7, 8 and 9
Summative assessment	Midterm Exam	2 hr	10% (10)	7	LO # 1-11
	Final Exam	2 hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	BASIC CONCEPTS OF THERMODYNAMICS
Week 2	PROPERTIES OF PURE SUBSTANCES
Week 3	FIRST LAW OF THERMODYNAMICS
Week 4	IDEAL AND REAL GASES
Week 5	Application of First Law to Steady Flow Process
Week 6	AVAILABILITY AND IRREVERSIBILITY
Week 7	SECOND LAW OF THERMODYNAMICS AND ENTROPY
Week 8	Limitations of First Law of Thermodynamics and Introduction to Second Law
Week 9	Performance of Heat Engines and Reversed Heat Engines 5.3. Reversible Processes Statements of Second Law of Thermodynamics
Week 10	GAS POWER CYCLES
Week 11	REFRIGERATION CYCLES
Week 12	Mid-term Exam
Week 13	VAPOUR POWER CYCLES
Week 14	Limitations of First Law of Thermodynamics and Introduction to Second Law
Week 15	GASES AND VAPOUR MIXTURES
Week 16	**Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1:calibration of gas pressure gauge
Week 2	Lab 2: calibration of temperature gauge
Week 3	Lab 3: study of Carnot cycle
Week 4	Lab 4: study of compressor cycle
Week 5	Lab 5: study of heat engine cycle
Week 6	Lab 6: ranking cycle
Week 7	Lab 7: gas turbine cycle

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Fundamentals Of Mechanical Engineering Thermodynamics true Theory Of Machines And Strength Of Materials 2Nd Ed. (G. S. Sawhney) (z-lib.org)	yes
Recommended Texts	ENGINEERING THERMODYNAMIC T HIRD EDITION SI Units Version R. K. Rajput	No
Websites	https://www.coursera.org/browse/physical-science-and-engineering/mechanical-engineering	

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks (%)**	**Definition**
Success Group (50 - 100)	**A** - Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX** – Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Engineering Metallurgy**			**Module Delivery**	
Module Type	**Core learning activity**			☒ **Theory** ☒ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**BEM223**				
ECTS Credits	**7**				
SWL (hr/sem)	**175**				
Module Level	2		**Semester of Delivery**	4	
Administering Department	Type Dept. Code		**College**	Type College Code	
Module Leader	Dr. Haider Mahdi Lieth		**e-mail**	haider.lieth@uobasrah.edu.iq	
Module Leader's Acad. Title	Assistant Prof.		**Module Leader's Qualification**	Ph.D.	
Module Tutor	Dr. Haider Mahdi Lieth		**e-mail**	haider.lieth@uobasrah.edu.iq	
Peer Reviewer Name	Name		**e-mail**	E-mail	
Scientific Committee Approval Date	01/06/2023		**Version Number**	1.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None	**Semester**	
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	1. The objective of the course is to provide the background necessary to make informed decisions and recommendations concerning the suitability of metals and alloys for engineering applications. It explores the way in which alloys are used and the way in which production and fabrication routes influence their fitness for purpose. 2. The first segment of the course considers the principal properties of engineering alloys that are of major importance for the practicing mechanical engineer, namely properties such as strength, toughness, stiffness, and ductility. 3. To help in understanding the chemical make-up and different macroscopic and microscopic structure. 4. To understand process of extraction, refining and production of different metals, ferrous and non-ferrous alloys. 5. The microstructure of a metal, the structural features that are control to observation under a microscope. 6. Microstructure determines mechanical properties of the metal, including their elastic and plastic behavior when applying the force. 7. Chemical composition is the relative content of a particular element within an alloy, usually expressed as a percent weight. Metals and their alloys are widely used in our daily live
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Clarify the engineering materials classifications and their divisions. 2. Identify ferrous materials and their properties 3. Identifying non-ferrous materials and their classifications and addressing their properties 4.Understand the structures, properties and applications of metals, 5. Understand causes of environmental pollution due to processing of engineering materials and environmental cost of corrosion of materials and propose their control. 6. Apply the acquired knowledge to make appropriate materials selection for engineering applications.
Indicative Contents المحتويات الإرشادية	• Readings, self-learning, panel discussions. • Exercises and activities in the lecture. • Homework. • Directing students to some websites to benefit and develop capabilities. • Conducting seminars to explain and analyze a specific issue and find solutions to it.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	1. Lectures for explanation and clarification. 2. The exhibition of scientific materials using display technologies such as data projectors, smart boards, and plasma panels. 3. Self-study via homework and mini-projects inside lectures. 4. Laboratories. 5. Projects for graduation. 5.Visits to scientific institutions. 6.Seminars are held in the department.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	107	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	7
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	68	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	4.5
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	175		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	2	10% (10)	4, 10	LO #1, 2, and 3
	Assignments	2	10% (10)	2, 12	LO # 3, 4, 5 and 6
	Projects / Lab.	1	10% (10)	Continuous	All
	Report	1	10% (10)	13	LO # 7, 8 and 9
Summative assessment	**Midterm Exam**	2 hr	10% (10)	7	LO # 1-11
	Final Exam	2 hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	classifications of materials, Mechanical properties, The Periodic Table
Week 2	CRYSTALSTRUCTURES , Points, Directions, and Planes in the Unit Cell, Imperfections in the Atomic Arrangements, Dislocations
Week 3	Solidification, Cooling Curves, Nucleation, Equilibrium Diagrams
Week 4	Thermal Equilibrium diagrams, Substitution solid solution, Interstitial solid solution, BINARY ISOMORPHOUS SYSTEMS
Week 5	Ferrous materials, The Iron-Carbon Phase Diagram, Properties and application of plain steel carbon
Week 6	Heat Treatment of Steel, Types of Heat Treatment Processes, Annealing
Week 7	Normalizing, Hardening, Tempering, Nitriding, Carburising, Case hardening or surface hardening
Week 8	Alloy Steel, Manganese Steel, stainless steel
Week 9	Austenitic steels, ferritic steels, Martensitic steels, Duplex stainless steels, Precipitation-hardening stainless steel, Tool steel
Week 10	Mechanical properties, Tension Tests, Compression Tests, Shear and Torsional Tests, STRESS–STRAIN BEHAVIOR
Week 11	Plastic Deformation, TRUE STRESS AND STRAIN, Hardness, Relationship between hardness and the flow curve
Week 12	Cast Irons, Types of Cast Iron, Grey cast iron, White cast iron, Nodular cast iron
Week 13	Malleable cast iron, Compacted Graphite Iron, Alloy cast iron
Week 14	non-ferrous metals, classification of non-ferrous metals, Light metals: Aluminum, Magnesium, Titanium, Beryllium
Week 15	Heavy metals: Copper, Zinc, Lead, Tin, Refractory metals: Tungsten, Nickel, Molybdenum, Chromium, Precious metals: Gold, Silver, Platinum
Week 16	**Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: Preparation of Metallographic Specimens
Week 2	Lab 2: Hardness Tests
Week 3	Lab 3: Impact Test

Week 4	Lab 4: Creep Test
Week 5	Lab 5: Heat Treatment for Ferrous Alloys

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	1-Materials Science and Engineering: An Introduction, 10th Edition, William D. Callister Jr., January 2018. 2-Selection and Use of Engineering Materials by J. A. Charles, F. A. A. Crane, and J. A. G. Furness, Third Edition 2001. 3-The Science and Engineering of Materials by D. R. Askeland, and P. Phule Fourth Edition 2003.	Yes
Recommended Texts	Concepts of Materials Science, By Adrian P. Sutton · 2021	No
Websites		

Grading Scheme
مخطط الدرجات

Group	Grade	التقدير	Marks (%)	Definition
Success Group (50 - 100)	**A** - Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX** – Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Mechanical Drawing**			**Module Delivery**	
Module Type	Core			☒ **Theory** ☒ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**BEM224**				
ECTS Credits	**4**				
SWL (hr/sem)	**100**				
Module Level	2		**Semester of Delivery**	4	
Administering Department	Type Dept. Code		**College**	Type College Code	
Module Leader	Dr. Asmaa Aassy Kawy		**e-mail**	Asmaa.kawy@uobasrah.edu.iq	
Module Leader's Acad. Title	Lecturer		**Module Leader's Qualification**	Ph.D.	
Module Tutor	Dr. Asmaa Aassy Kawy		**e-mail**	Asmaa.Kawy@uobasrah.edu.iq	
Peer Reviewer Name	Name		**e-mail**	E-mail	
Scientific Committee Approval Date	01/06/2023		**Version Number**	1.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None	**Semester**	
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	1- Understand the importance of mechanical drawing for the engineer and its applications 2- Recognizing the basics of representing the various mechanical parts in engineering drawing and the student's awareness of mechanical drawing as one of the scientific bases for working in the implementation of mechanical works. 3- Teaching the student the important role of drawing in achieving solutions to technical problems in designing machines, machines, devices, tools, and implementing and manufacturing mechanical parts. 4- Teaching the student the principles of assembling and dismantling mechanical systems, methods of connecting parts, the foundations of welding, and how to write their symbols 5- The student learned how to write and read mechanical drawing boards in general.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	A- Knowledge and Understanding A1. Acquisition of skills in drawing mechanical parts and knowledge of engineering symbols and terms and standard specifications in engineering and mechanical drawing with the necessary skill to read and write industrial drawings. A2- Acquiring basic skills as an introduction to design programs such as AutoCAD and other programs that are applied in practical applications. A3- Gain a basic understanding of how to draw simple and complex assembled mechanical parts in practical life A4- Informing the student of the role of engineering drawing and its relationship to the production of various industrial products and drawing them in all their fine details. B. Subject-specific skills B1. The student acquires the skill to read and understand the schematics of mechanical parts and systems resulting from their assembly B 2- Representation of the individual mechanical parts and the resulting systems from their assembly by mechanical drawing . B 3- Acquiring the skill of connecting mechanical parts and the foundations of assembling and dismantling mechanical systems. B4- Read and represent all the minute details of the surfaces and properties of metals and the methods of connecting mechanical systems.
Indicative Contents المحتويات الإرشادية	A- Knowledge and Understanding A1. Acquisition of skills in drawing mechanical parts and knowledge of engineering symbols and terms and standard specifications in engineering and mechanical drawing with the necessary skill to read and write industrial drawings. A2- Acquiring basic skills as an introduction to design programs such as AutoCAD and other programs that are applied in practical applications. A3- Gain a basic understanding of how to draw simple and complex assembled mechanical parts in practical life A4- Informing the student of the role of engineering drawing and its relationship to

	the production of various industrial products and drawing them in all their fine details. B. Subject-specific skills B1. The student acquires the skill to read and understand the schematics of mechanical parts and systems resulting from their assembly B 2- Representation of the individual mechanical parts and the resulting systems from their assembly by mechanical drawing . B 3- Acquiring the skill of connecting mechanical parts and the foundations of assembling and dismantling mechanical systems. B4- Read and represent all the minute details of the surfaces and properties of metals and the methods of connecting mechanical systems.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	1- The lectures and their inclusion of various methods such as pictures, drawings and models as means of clarification to explain and draw topics in detail. 2- Asking questions and inquiries that are distinguished by depth and accuracy. 3- Directing the student towards the many practical questions of the subject. 4- Develop the digital sense of expression. 5- Brainstorming.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	62	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	38	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	2.5
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	100		

Module Evaluation

تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	10% (10)	4, 10	LO #1, 2, and 3
	Assignments	2	10% (10)	2, 12	LO # 3, 4, 5 and 6
	Projects / pr	1	10% (10)	Continuous	All
	Report	1	10% (10)	13	LO # 7, 8 and 9
Summative assessment	Midterm Exam	2 hr	10% (10)	7	LO # 1-11
	Final Exam	2 hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	A review of drawing lines and projections in the first and third projection angles and free drawing + Screw threads
Week 2	Screw fastening and nuts + Rivets and rivets joints
Week 3	Keys, cotter- joints and pin joints + Shaft coupling
Week 4	Welded joints + Detail drawing (part drawing)
Week 5	Engen parts/ pistons + stuffing box & crossheads
Week 6	Cranks and Connecting rod + Eccentric
Week 7	Assembly drawing + Shaft Bearings
Week 8	Pulleys
Week 9	Welded joints
Week 10	Spur Gears
Week 11	Fits, limits and Tolerance
Week 12	Surface finishing
Week 13	Valves
Week 14	Drawing analysis
Week 15	Drawing analysis
Week 16	**Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	
Week 2	
Week 3	
Week 4	
Week 5	
Week 6	

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	1-Mechanical Drawing /Shri N.D Bhat	Yes
Recommended Texts	2-Mechanical Drawing / K.L. Narayana	No
Websites		

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks (%)**	**Definition**
Success Group (50 - 100)	**A -** Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX –** Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Electrical Machines**			**Module Delivery**	
Module Type	**Support**			☒ **Theory** ☒ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**BEM225**				
ECTS Credits	**7**				
SWL (hr/sem)	**175**				
Module Level	2		**Semester of Delivery**	4	
Administering Department	Type Dept. Code		**College**	Type College Code	
Module Leader	Ali Kadhim Abdulabbas		**e-mail**	ali.abdulabbas@uobasrah.edu.iq	
Module Leader's Acad. Title	Ass. Professor		**Module Leader's Qualification**	Ph.D.	
Module Tutor	Name (if available)		**e-mail**	E-mail	
Peer Reviewer Name	Name		**e-mail**	E-mail	
Scientific Committee Approval Date	01/06/2023		**Version Number**	1.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	Electrical Engineering	**Semester**	2
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	1. Identifying the machine's (continuous and alternating) installation and derivation of the E.M.F equation and the equivalent circuit of the motors 2. Identify the types of generators and their features. 3. Identify the types of motors and their features. 4. Learn about the applications of generators and motors. 5. Identify electrical transformers and derive the E.M.F equation. and its equivalent circuit. 6. Learn how synchronous machines work and features 7. Learn how semiconductors work 8. Learn how to measure electrical and non-electrical quantities.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Learn how DC and AC generators work and their features. 2. Learn how DC and AC motors work and the features 3. Explain the basic principles of the work of generators and synchronous motors and link them to practical applications. 4. Explain the basic principles of semiconductor work 5. Explanation of the basic principles of the work of relays and circuit breakers 6. Explanation of the basic principles of the mechanism of measuring electrical and non-electrical quantities 7. Allocating lectures to solve theoretical issues and discuss basic concepts. 8. Directing students to each other to benefit from systematic training for the third stage.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. <u>Part A – D.C.machine theory and induction motor</u> DC machine construction– E.M.F. Equation and output equation and commutation, Types of dc generators DC Motor types Dc generators characteristics, Starting of dc motors Speed control, Principle of action E.M.F. equation, leakage reactions [15 hrs] equivalent circuit, voltage regulation and efficiency, open circuit ,and short circuit tests. Production of rotating magnetic field –[15 hrs] induction motor - Production of rotating magnetic field,synchronous speed and slip, equivalent circuit – torque / speed curve, – starting of cage and slip – ring induction motors , speed control and reversal of direction. . [10 hrs] Revision problem classes [21 hrs]

	Part B – Synchronous machine and power system E.M.F. equation – armature reaction, synchronous impedance voltage regulation – synchronization, Synchronous motor– principle of operation, starting methods V. curves application of synchronous motors. [15 hrs] Semiconductor diodes – Rectifiers, Different types of Bridge circuits, Transistors – Power Amplifiers measurement of non – electrical parameters pressure, velocity, flow, temperature, etc [7 hrs] SCRs and their applications., Means of industrial power supply – Factory layouts for distribution and sub. – stations – protection schemes – relays and circuit breakers, power factor corrections., [15 hrs]

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Type something like: The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials and by considering type of simple experiments involving some sampling activities that are interesting to the students.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	107	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	7
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	68	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	4.5
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	175		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	2	10% (10)	5, 10	LO #1, 2, 10 and 11
	Assignments	2	10% (10)	2, 12	LO # 3, 4, 6 and 7
	Projects / Lab.	1	10% (10)	Continuous	All
	Report	1	10% (10)	13	LO # 5, 8 and 10
Summative assessment	**Midterm Exam**	2 hr	10% (10)	7	LO # 1-7
	Final Exam	2 hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Introduction - DC machine construction Magnetic Circuit
Week 2	E.M.F. Equation and output equation and commutation-Types of dc generators DC Motor types Dc generators characteristics
Week 3	Test of dc generators DC motor characteristic-Starting of dc motors Speed control.
Week 4	Principle of action E.M.F. equation- leakage reactions
Week 5	equivalent circuit-voltage regulation and efficiency
Week 6	open circuit and short circuit tests- Production of rotating magnetic field
Week 7	synchronous speed and slip-equivalent circuit – torque / speed curve
Week 8	starting of cage and slip – ring induction motors- speed control and reversal of direction.
Week 9	E.M.F. equation – armature reaction- synchronous impedance voltage regulation – synchronization.
Week 10	starting methods, V curves application of synchronous motors- Semiconductor diodes – Rectifiers
Week 11	Different types of Bridge circuits- Transistors – Power Amplifiers-
Week 12	SCRs and their applications. Means of industrial power supply – Factory layouts for distribution and sub.
Week 13	stations – protection schemes – relays and circuit breakers-Illumination and heating designs

Week 14	power factor corrections- Measurement of current, voltage and power – recording of energy consumption
Week 15	voltage divider extension of instrument range
Week 16	**A preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: Introduction to D.C machine
Week 2	Lab 2: Magnetization curve
Week 3	Lab 3: the test of separately-excited D.C. machine.
Week 4	Lab 4: the test of shunt-excited D.C. machine.
Week 5	Lab 5: Test of open and short of induction machine
Week 6	Lab 6: Test of synchronous machine.
Week 7	Lab 7: Transmission line.

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Edward Hughes - Hughes electrical and electronic technology [electronic resource]-Pearson Education (2012).pdf	Yes
Recommended Texts	Electrical technology by Hindmarch	yes
Recommended Texts	Electrical Technology by Theraja	No
Websites	https://www.coursera.org/browse/physical-science-and-engineering/electrical-machines.	

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks (%)**	**Definition**
Success Group (50 - 100)	**A -** Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX –** Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Engineering Analysis**			**Module Delivery**	
Module Type	**Support**			☒ **Theory** ☒ **Lecture** ☐ **Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**BEM311**				
ECTS Credits	**5**				
SWL (hr/sem)	125				
Module Level	3		**Semester of Delivery**	5	
Administering Department	ME		**College**	ENGINEERING	
Module Leader	Jaafar Khalaf Ali		**e-mail**	jaafar.ali@uobasrah.edu.iq	
Module Leader's Acad. Title	Ass. Prof.		**Module Leader's Qualification**	Ph.D.	
Module Tutor	Name (if available)		**e-mail**	E-mail	
Peer Reviewer Name	Name		**e-mail**	E-mail	
Scientific Committee Approval Date	01/06/2023		**Version Number**	1.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None	**Semester**	
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	1. Preparing and qualifying engineers to meet the requirements of the labor market in the private and public sectors in mechanical engineering. 2. Providing distinguished academic programs in the field of mechanical engineering, both theoretical and practical, that comply with international standards of academic quality and meet the needs of the labor market. 3. Developing and improving scientific research in the fields of mechanical engineering, writing programs for solving differential equations and complex functions, data processing, digital signal analysis and control. 4. Preparing a stimulating environment for faculty members to develop their knowledge and educational and research skills. 5. Building and developing partnerships with the governmental and private sectors and the community with all its various institutions.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	**A. Knowledge and Understanding** A1- Clarify the basic concepts of Engineering Analysis and their applications in social and industrial fields. A2- Acquiring the skill in dealing with and addressing problems through the acquired sciences in this field. A3- Acquisition of basic skills to solve engineering problems. A4- Gaining experience in describing engineering problems mathematically and finding related equations to solve them. **B. Subject-specific skills** B1 - The ability to solve mathematical equations. B 2 - The ability to think about addressing problems according to the algorithms and methods of their work. B 3 - Writing scientific reports, reading charts, and analyzing digital data.
Indicative Contents المحتويات الإرشادية	**Complex variables (50 hrs.)** Complex number and variable operations, derivative and analytic functions, Cauchy Riemann equation, geometry of analytic function. Complex integration Line integral in the complex plane, Cauchy's integral theorem, Cauchy's integral formula, derivatives of analytic functions. **Fourier series (40 hrs.)** Periodic functions, Fourier series, even and odd functions, half range expansion, complex Fourier series, Fourier integral, Fourier cosine and sine transforms, Fourier transform. **Laplace Transform of Special Functions and Cases (20 hrs.)**

	Laplace Transform of Special Functions such as unit step, periodic function and Cases Inverse Laplace Transform **Partial Differential Equations (40 hrs.)** Basic concept, modeling vibrating string, wave equation, heat equation, separation of variables, D 'Alembert solution of the wave equation, modeling of membrane 2D wave equation, rectangular membrane , Laplacian in polar coordinate, solution by Laplace transform.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	**Teaching and Learning Methods** 1. Explanation and clarification through lectures. 2. Using data show, smart boards, and plasma screens. 3. Self-learning through homework and mini-projects within the lectures. 4. Laboratories. 5. Graduation projects. 6. Scientific visits. 7. Seminars held in the department. 8. Mid-term and summer training. **Assessment methods** 1. Short exams (quizzes). 2. Homework. 3. Semester and final exams for theoretical and practical subjects. 4. Small projects within the lesson. 5. Interaction within the lecture. 6. Reports

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	77	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	5
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	48	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	3.2
Total SWL (h/sem)	125		

الحمل الدراسي الكلي للطالب خلال الفصل	

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	2	10% (10)	5, 10	LO #1, 2, 10 and 11
	Assignments	2	10% (10)	2, 12	LO # 3, 4, 6 and 7
	Projects / Lab.	1	10% (10)	Continuous	
	Report	1	10% (10)	13	LO # 5, 8 and 10
Summative assessment	**Midterm Exam**	2 hr	10% (10)	7	LO # 1-7
	Final Exam	2hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Complex Functions
Week 2	Special Complex Functions
Week 3	Continuity and Differentiation
Week 4	Cauchy-Riemann Equations
Week 5	Complex Integration
Week 6	Fourier Series
Week 7	Complex Fourier Series
Week 8	Laplace Transform of Special Functions and Cases
Week 9	Inverse Laplace Transform
Week 10	Ordinary Differential Equations
Week 11	Solution of ODE
Week 12	Partial Differential Equation
Week 13	Using Separation of Variables to Solve PDE (Solution of 1-Dim wave equation)
Week 14	Solution of 1-Dim Diffuse Equation

Week 15	Solution of 2-Dim Laplace Equation

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	
Week 2	
Week 3	
Week 4	
Week 5	
Week 6	
Week 7	

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	1.Advanced Engineering Mathematics, Wylie, McGraw Hill Books Company. 2.Advanced Engineering Mathematics, Kreyszig, Jon Wylie and Sons. 3.Mathematical Methods for Engineers and Scientists, K. T. Tang	Yes
Recommended Texts		
Websites		

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks (%)**	**Definition**
Success Group (50 - 100)	**A -** Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
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	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
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	F – Fail	راسب	(0-44)	Considerable amount of work required

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Gas Dynamics & Turbomachines**			**Module Delivery**	
Module Type	**Core**			☒**Theory** ☒**Lecture** ☒**Lab** ☒**Tutorial** ☐**Practical** ☐**Seminar**	
Module Code	**BEM312**				
ECTS Credits	8				
SWL (hr/sem)	**200**				
Module Level		3	**Semester of Delivery**		5
Administering Department		Type Dept. Code	**College**	Type College Code	
Module Leader	Dr. Muneer A. Ismael		**e-mail**	Muneer.ismael@uobasrah.edu.iq	
Module Leader's Acad. Title		Professor	**Module Leader's Qualification**		Ph.D.
Dr. Muneer A. Ismael	Dr. Muneer A. Ismael		**e-mail**	Muneer.ismael@uobasrah.edu.iq	
Peer Reviewer Name		Name	**e-mail**	E-mail	
Scientific Committee Approval Date		01/06/2023	**Version Number**	1.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None	**Semester**	
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	1. Understanding the basics of compressible flow and its application to gas and compressed air transmission systems. 2. Understanding the basics of the work of rocket and jet engines. 3. Avoiding the problems of shocks and expansion waves on sonic and supersonic airplanes. 4. Understanding the principles of water turbines 5. Understanding the principles of pumps, their connection, and the problem of cavitation. 6. Understanding the principles of axial flow compressors and how to design multi-stages compressors.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Clarify the basic concepts of compressible flow. 2. Acquisition of skills in dealing with problems and issues related to compression flow. 3. Shock and expansion waves on aircraft and wedges. 4. Acquisition of basic skills as an introduction to the study of flow around aircraft. 5. Gain a basic understanding of how jet propulsion engines work. 6. The ability to gain experience in dealing with jet engines. 7. Clarify the basic concepts of fluid machinery. 8. Acquisition of basic skills in studying pump problems. 9. Gain a basic understanding of how axial gas compressors work. 10. The ability to know the types of water turbines and choose the most appropriate type according to the available water column. 11. The ability to gain experience in dealing with pumps and their problems
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. <u>Part A – Dynamics of Gases</u> Compressible flow – definition of compressible flow and how is differ from incompressible flow, Flow through variable area ducts, unusual phenomenon in compressible flow, the critical area of compressible flow [15 hrs] Solution Assist – How to use tables in solving the problems of compressible flow, how to use charts in solving the problems of shock and expansion waves. [10 hrs] Applications I – The application of compressible flow in rocket engines. [10 hrs] Applications II – The application of compressible flow in turbojet engines. [15 hrs] <u>Part B - Turbomachinery</u> Fundamentals: The role of momentum equation in studying the turbomachinery issues [10 hr]

	The importance of water turbines in renewable energy [15 hrs] The importance of pumps in industrial applications [15 hrs] The importance of axial compressor in aircraft applications [15 hrs]

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	1. Explanation and clarification through lectures. 2. The method of displaying scientific materials with display devices: data projectors, smart boards, and plasma screens. 3. Self-learning through homework and mini-projects within the lectures. 4. Laboratories. 5. Graduation projects. 6. Scientific visits. 7. Seminars held in the department. 8. Summer training.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	122	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	8
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	78	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	5.2
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	200		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	2	10% (10)	5, 10	LO #1, 4, 10 and 11
	Assignments	2	10% (10)	2, 12	LO # 2, 4, 6 and 8
	Projects / Lab.	1	10% (10)	Continuous	All
	Report	1	10% (10)	13	LO # 4, 9 and 11

Summative assessment	**Midterm Exam**	2 hr	10% (10)	7	LO # 1-6
	Final Exam	2 hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Introduction on gas dynamic and isentropic flow
Week 2	Mach number and Mach cone and flow through variable area duct
Week 3	flow cases in c-d nozzle and flow cases in a converging nozzle
Week 4	normal and oblique shock waves
Week 5	expansion wave and Prandtl Mayer function
Week 6	rocket engine and turbojet engine
Week 7	fuel consumption in turbojet engine twin-spool turbojet engine
Week 8	introduction on fluid power and impulse turbine-Pelton wheel
Week 9	reaction turbine, reaction turbine-Francis turbine
Week 10	principles and components of axial turbines, velocity diagrams in Kaplan turbine
Week 11	Similarity rules
Week 12	centrifugal pumps and pumps connection
Week 13	Cavitation in pumps
Week 14	Axial flow compressor
Week 15	Pressure ratio in axial flow compressor and the degree or reaction
Week 16	**Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1-2	Lab 1: Chocking phenomenon in compressible flow
Week 3-4	Lab 2: Efficiency of Francis turbine
Week 5-6	Lab 3: Effect of guide vanes angle on the Francis turbine

Week 7-8	Lab 4: Characteristics of centrifugal fans
Week 9-10	Lab 5: Performance of centrifugal pumps
Week 11-12	Lab 6: Series and parallel connections of centrifugal pumps
Week 13-14	Lab 7: Visualization of cavitation in pumps

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	1. Fundamentals of Fluid Mechanics 7th Edition by Bruce R. Munson 2. Fundamentals of Gas Dynamics 3. Gas Turbine Theory by H. Cohen et al.	Yes
Recommended Texts	1. Gas dynamics by James E A John	No
Websites	https://aerospaceweb.org/design/scripts/compress.shtml	

Grading Scheme
مخطط الدرجات

Group	Grade	التقدير	Marks (%)	Definition
Success Group (50 - 100)	**A -** Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX –** Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Manufacturing Processes**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☒ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**BEM313**				
ECTS Credits	**9**				
SWL (hr/sem)	**225**				
Module Level	3		**Semester of Delivery**	5	
Administering Department	Type Dept. Code		**College**	Type College Code	
Module Leader	Rafid Jabbar Mohammed		**e-mail**	rafid.mohammed@uobasrah.edu.iq	
Module Leader's Acad. Title	Lecturer		**Module Leader's Qualification**	Ph.D.	
Module Tutor	Name (if available)		**e-mail**	E-mail	
Peer Reviewer Name	Name		**e-mail**	E-mail	
Scientific Committee Approval Date	01/06/2023		**Version Number**	1.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None	**Semester**	
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	1. Preparing and qualifying specialized engineers to meet the requirements of the labor market in the private and public sectors in mechanical engineering through diversifying the methods of learning and teaching and training students to apply the acquired knowledge and skills to solve real problems. 2. Providing distinguished academic programs in the field of manufacturing processes engineering, both theoretical and practical, to comply with international standards of academic quality and meet the needs of the labor market. 3. Encouraging and developing scientific research in the fields of manufacturing processes engineering in general. 4. Preparing a stimulating environment for faculty members to develop their knowledge and educational and research skills. 5. Building and developing partnership with the governmental and private sectors and society in all its various institutions.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	A. Knowledge and Understanding A1- Clarify the basic concepts of mechanical manufacturing processes and their applications in industrial fields. A2- Acquiring the skill in dealing with manufacturing problems and solving them through mechanical calculations and mathematical models. A3- Acquisition of basic skills for the manufacture of mechanical parts. A4- Gaining experience in industrial systems and designing according to the calculation of the loads applied during the manufacturing operations. A 5- The ability to treat or avoid defects in the product during the manufacturing and production processes. B. Subject-specific skills B1 - The ability to design various manufacturing machines through knowledge of the applied loads. B2 - The ability to think and address defects that arise during manufacturing processes. B 3 - Writing scientific reports on manufacturing operations. B 4 - Choosing and determining the appropriate manufacturing process for each product according to the required specifications and product quality.
Indicative Contents المحتويات الإرشادية	**Manufacturing Processes: Introduction** **Casting fundamentals:** Casting processes characteristics**,** Casting techniques. **Sand casting:** Molding sand, Sand testing**,** Patterns, Molding machines, foundry furnaces, Cleaning and inspection of casting. **Die casting methods:** Pressure die casting methods. **Other casting methods:** Centrifugal casting , Lost-wax casting, Shell molding process, Continuous casting.

	Metal forming: Hot working of metal, Cold working of metal. **Hammering /Forging:** Types of forging processes, Hand forging tools, Automatic hammer forging, Die forging machines. **Rolling:** Types of Rolling machines, Calculation the angle of contact, Hot and cold Rolling processes. **Extrusion:** Methods of Extrusion, Tube Extrusion, Impact Extrusion. **Drawing:** Wire drawing machines, Tube drawing machines, Metal preparation for drawing. **Sheet metal work:** Processes of sheet metal forming, Joining of sheet metal, Soldering. **Metal cutting:** Chiseling steel metal, Filing steel metal, Sawing steel metal. **Turning operations:** Types of turning machines, Parts of turning machines, The lath as a general purpose machine. **Shaping operations:** Classification of shapers. **Milling operations:** Types of milling machines. **Drilling operations:** Drills, Reamers, Drilling machines, Boring machines. **Grinding operations:** Types of grinding machines, Grinding tools. **Welding:** Electric Arc Welding, Metal Arc Welding, Tungsten and Metal Inert gas welding, Plasma welding. **Fusion welding:** Oxy acetylene welding, Thermit welding, Electron beam welding, Laser welding, Ultrasonic welding, Diffusion welding, Projection welding, Flash welding. **Soldering and Brazing:** Brazing and Soldering metals and alloys, The factors that the process depends on. **Solid-state welding and other types of welding:** Electric resistance welding, Friction welding, Explosion welding. **CNC machines:** NC definition and comparison, Traditional tool machines and CNC machines comparison, Financial advantages and disadvantages of CNC, DNC- Direct numerical control CAD/CAM-Hierarchical NC. **Non Traditional machining:** Ultrasonic machining, Chemical machining, Electro chemical machining, Electro spark machining, Electron beam machining, Laser machining, Electron grinding machining

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Type something like: The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time

	refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials and by considering type of simple experiments involving some sampling activities that are interesting to the students.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	137	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	9
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	88	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	5.8
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	225		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	2	10% (10)	5, 10	LO #1, 2, 10 and 11
	Assignments	2	10% (10)	2, 12	LO # 3, 4, 6 and 7
	Projects / Lab.	1	10% (10)	Continuous	All
	Report	1	10% (10)	13	LO # 5, 8 and 10
Summative assessment	**Midterm Exam**	2 hr	10% (10)	7	LO # 1-7
	Final Exam	2 hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Introduction to Manufacturing Processes; definitions, classification of engineering material, classification of manufacturing processes.

Week 2	Casting processes; definitions, calculations of solidification time and pouring time, riser design calculations, shrinkage phenomena, chill types, types of casting processes, pattern types.
Week 3	expendable mold casting, sand casting, shell casting, investment casting, evaporative-foam casting, permanent mold casting, low pressure casting, die casting, centrifugal casting, continuous casting, casting quality.
Week 4	Metal forming processes; definitions, stress-strain curve, mechanical material properties, flow stress, average flow stress, stain rate, behavior of materials at elevated temperature.
Week 5	Rolling processes; calculations of force, torque and power at cold and hot rolling, types of rolling machines, types of rolling processes
Week 6	Extrusion processes; calculations of pressure, force and power at cold and hot extrusion, types of extrusion processes, defects of extrusion processes
Week 7	Drawing processes; calculations of stress, force and power at cold drawing, types of drawing machines, nonconventional drawing processes, dieless drawing processes
Week 8	Forging processes; calculations of forging force, types of forging processes, Sheetmetal working processes; sheetmetal cutting, sheetmetal bending, sheetmetal deep drawing
Week 9	Machining processes; conventional machining processes; turning processes, milling processes, drilling processes, sawing processes, broaching processes, shaping processes, abrasive processes.
Week 10	Non-conventional machining processes; ultrasonic machining, water jet cutting, electrochemical machining, electrical discharge machining, laser beam machining, electron beam machining, plasma torch cutting, oxyfuel cutting, chemical machining.
Week 11	Calculations of cutting force and power in conventional machining, calculation of cutting time in conventional machining, optimization of cutting speed in conventional machining
Week 12	Welding processes; fusion welding processes, arc welding processes, resistance welding processes
Week 13	Solid-state welding processes, weld quality, design considerations in welding, soldering and brazing processes, mechanical assembly processes
Week 14	Manufacturing systems; manufacturing automation, manufacturing control systems,
Week 15	CNC Manufacturing; analysis of NC positioning systems, precision on NC positioning, NC part programming.
Week 16	**Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: welding test
Week 2	Lab 2: turning test
Week 3	Lab 3: drilling test
Week 4	Lab 4: shaping test
Week 5	Lab 5:
Week 6	Lab 6:
Week 7	Lab 7:

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	FUNDAMENTALS OF MODERN MANUFACTURING: Materials, Processes and Systems, Mikel P. Groover, 4th edition, John Wiley & Sons, Inc, 2010.	Yes
Recommended Texts	FUNDAMENTALS OF MODERN MANUFACTURING: Materials, Processes and Systems, Mikel P. Groover, 4th edition, John Wiley & Sons, Inc, 2010.	Yes
Websites		

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks (%)**	**Definition**
Success Group (50 - 100)	**A** - Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX** – Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Internal Combustion Engines**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☒ **Lecture** ☒ **Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**BEM314**				
ECTS Credits	**8**				
SWL (hr/sem)	**200**				
Module Level	3		**Semester of Delivery**	5	
Administering Department	Type Dept. Code		**College**	Type College Code	
Module Leader	Dr. Alaa Hlaichi Mohammed		**e-mail**	Alaa.mohammed@uobasrah.edu.iq	
Module Leader's Acad. Title	Lecturer		**Module Leader's Qualification**	Ph.D.	
Module Tutor	Dr. Alaa Hlaichi Mohammed		**e-mail**	Alaa.mohammed@uobasrah.edu.iq	
Peer Reviewer Name	Name		**e-mail**	E-mail	
Scientific Committee Approval Date	01/06/2023		**Version Number**	1.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None	**Semester**	
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	1. Graduating engineering cadres specialized in the fields of mechanical engineering in line with the progress made in the field of Internal Combustion Engines 2. Providing the labor market with cards that have the ability to deal with modern Internal Combustion Engines in the fields of mechanical engineering. 3. Work in scientific research in the field of Internal Combustion Engines and analysis of data in laboratory and practical results. 4. Coordination of work with researchers in Internal Combustion Engines as groups in order to advance the reality of scientific research in this field. 5. Producing projects, targeted and applicable research, and marketing.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	A. Knowledge and Understanding A1- Establishing the basic principles of Internal Combustion Engines. A2- Building advanced models for modern Internal Combustion Engines. A3- Designing Internal Combustion Engines for devices and equipment. A4- Maintenance of Internal Combustion Engines. A5- Developing old Internal Combustion Engines. A6 - Explanation and clarification of modern Internal Combustion Engines. A 7- Use of artificial intelligence techniques in Internal Combustion Engines. B. Subject-specific skills B1 - The possibility of studying Internal Combustion Engines in modern devices. B2 - Gaining high confidence in the ability to design modern Internal Combustion Engines. B3 - Publishing research articles in the field of measuring engineering variables..
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. <u>Part A - Basic Engine types and Their Operation</u> Introduction to reciprocating engine. Familiarization basic engine nomenclature. Engine classification by cylinder arrangement. Spark ignition engine (4 – stroke and 2 – stroke cycle). Compression ignition engine (4 – stroke and 2 – stroke cycle). Fundamental differences between SI and CI Engines. Energy flow through a reciprocating engine. Rotary engines. The continuous – combustion gas turbine. The Wankel engine. [15 hrs] Engine Power and Performance: Basic power measurements. Indicated Mean effective pressure, Indicated power. Brake power. Friction power. Mean effective power. Specific fuel consumption.. [15 hrs] Thermodynamics of I.C. Engine: The Air– Cycle approximation: importance of thermal efficiency. Theoretical cycles. Air – cycle approximations. Air – cycle calculations. Air –

	cycle efficiency. Effect of engine variables. The Fuel – Air Cycle Approximation: use of the fuel – air cycle. Scope of the fuel – air cycle. Effect of engine variables. The Actual Engine Cycle: Time required for combustion. Effect of engine variable on flame speed. Other actual – cycle losses. Power and efficiency of the actual cycle. [10 hrs]. Supercharged Engines and Their Performance:Definitions. Reasons for supercharging. Supercharging of S.I. Engine. Supercharging of Diesel Engines. Performance computations. Effects of operating variables on supercharged engines. [15 hrs] The Wankel Engine Comparison between Wankel Engine and reciprocating engine. Trochoid. Hypo – Trochoid. Wankel Engine Performance. [6 hrs] <u>Part B - Fuels of I.C. engines and Combustion</u> Fuels of I.C. engines and Combustion Calculations. Heating value of fuels. Ratings of SI Engine Fuels. Important Qualities of SI Engine Fuels. Qualities and Ratings CI Engine fuels. Combustion Calculations.. [15 hrs] Carbureting and Carburetors. Main metering system. The simple carburetor. Variables metering carburetor performance. Mixture control, carburetor types. The injection carburetor. [10 hrs] Spark Ignition. Ignition system requirements. Battery ignition system. Magneto ignition system. Spark plugs. Ignition timing. [15 hrs] General combustion theory. Normal combustion and flame front propagation. Factors affecting flame speed. Rate of pressure rise. Abnormal combustion. Engine operation variables affecting detonation. Combustion chamber design. The Compression Ignition Engine and Fuel Injection. General information pertaining to the C.I. Engine characteristics of the CI Engine. Types of CI Engines. Fuel supply and injection systems. Typical solid injection systems. The injector nozzle. [15 hrs] Combustion in the CI Engine. Ignition delay. Combustion knock in the CI Engine. Variables affecting ignition delay. General functions and characteristics of the combustion chamber. Comparison of some basic design of CI Engine combustion chamber. ([10 hrs] Cooling of IC Engine. Liquid cooling systems. Air cooling system. Engine cooling problems. Lubrication of IC Engines. Mechanism of lubrication. Types of bearings used in IC Engines. Properties of lubricating oils. Additives. Lubricating systems. Engine Design. Preliminary Analysis, cylinder number, size and arrangement. Detailed design procedure. [15 hrs]

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	1. Use of recorded video clips. 2. Direct attendance lectures. 3. Laboratories and practical experiments. 4. Practical projects. 5. Using modern display methods such as smart screens. 6. Scientific visits. 7. Seminars held in the department. 8. Preparing lectures using modern programs.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	122	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	8
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	78	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	5.2
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	200		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	2	10% (10)	5, 10	LO #1, 4, 10 and 11
	Assignments	2	10% (10)	2, 12	LO # 2, 4, 6 and 8
	Projects / Lab.	1	10% (10)	Continuous	All
	Report	1	10% (10)	13	LO # 4, 9 and 11
Summative assessment	**Midterm Exam**	2 hr	10% (10)	7	LO # 1-6
	Final Exam	2 hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Introduction to reciprocating engine. Familiarization basic engine nomenclature.
Week 2	Engine classification by cylinder arrangement. Spark ignition engine (4 – stroke and 2 – stroke cycle). Compression ignition engine (4 – stroke and 2 – stroke cycle).
Week 3	Fundamental differences between SI and CI Engines. Energy flow through a reciprocating engine. Rotary engines. The continuous – combustion gas turbine. The Wankel engine.
Week 4	Engine Power and Performance : Basic power measurements. Indicated Mean effective pressure, Indicated power.
Week 5	Brake power. Friction power. Mean effective power. Specific fuel consumption.
Week 6	The Air – Cycle approximation: importance of thermal efficiency. Theoretical cycles.
Week 7	Mid-term Exam + Air – cycle approximations. Air – cycle calculations. Air – cycle efficiency.
Week 8	Effect of engine variables. The Fuel – Air Cycle Approximation: use of the fuel – air cycle. Scope of the fuel – air cycle. Effect of engine variables.
Week 9	The Actual Engine Cycle: Time required for combustion. Effect of engine variable on flame speed. Other actual – cycle losses. Power and efficiency of the actual cycle.
Week 10	Definitions. Reasons for supercharging. Supercharging of S.I. Engine. Supercharging of Diesel Engines. Performance computations. Effects of operating variables on supercharged engines.
Week 11	Comparison between Wankel Engine and reciprocating engine. Trochoid. Hypo – Trochoid. Wankel Engine Performance.
Week 12	Fuels of I.C. engines and Combustion Calculations. Heating value of fuels. Ratings of SI Engine Fuels. Important Qualities of SI Engine Fuels.Qualities and Ratings CI Engine fuels. Combustion calculations.
Week 13	Carbureting and Carburetors. Main metering system. The simple carburetor. Variables metering carburetor performance. Mixture control, carburetor types. The injection carburetor.
Week 14	Ignition system requirements. Battery ignition system. Magneto ignition system. Spark plugs. Ignition timing. Combustion in S.I. Engines.General combustion theory. Normal combustion and flame front propagation. Factors affecting flame speed. Rate of pressure rise. Abnormal combustion. Engine operation variables affecting detonation. Combustion chamber design.
Week 15	General information pertaining to the C.I. Engine characteristics of the CI Engine. Types of CI Engines. Fuel supply and injection systems. Typical solid injection systems. The injector nozzle. Combustion in the CI Engine. Combustion in the CI Engine. Ignition delay. Combustion knock in the CI Engine. Variables affecting ignition delay. General functions and characteristics of the combustion chamber. Comparison of some basic design of CI Engine combustion chamber.
Week 16	Liquid cooling systems. Air cooling system. Engine cooling problems. Lubrication of IC Engines Mechanism of lubrication. Types of bearings used in IC Engines. Properties of lubricating oils. Additives. Lubricating systems. Engine Design.Preliminary Analysis, cylinder number, size and arrangement. Detailed design procedure.

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: Introduction to IC Engine
Week 2	Lab 2: Perkins engine
Week 3	Lab 3: Ricardo engine
Week 4	Lab 4: Peter Diesel Engine
Week 5	Lab 5: Calculation of volumetric Engine
Week 6	Lab 6: Gas turbine

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Engineering Fundamentals of the Internal Combustion Engine by Willard W. Pulkrabek.	Yes
Recommended Texts	Internal Combustion Engines Fundamentals by .B. Heywood	No
Websites		

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks (%)**	**Definition**
Success Group (50 - 100)	**A -** Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX –** Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Numerical Analysis**			**Module Delivery**	
Module Type	**Support**			☒ **Theory** ☒ **Lecture** ☐ **Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**BEM321**				
ECTS Credits	**6**				
SWL (hr/sem)	150				
Module Level	3		**Semester of Delivery**	6	
Administering Department	ME		**College**	ENGINEERING	
Module Leader	Jaafar Khalaf Ali		**e-mail**	jaafar.ali@uobasrah.edu.iq	
Module Leader's Acad. Title	Ass. Prof.		**Module Leader's Qualification**	Ph.D.	
Module Tutor	Name (if available)		**e-mail**	E-mail	
Peer Reviewer Name	Name		**e-mail**	E-mail	
Scientific Committee Approval Date	01/06/2023		**Version Number**	1.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None	**Semester**	
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	1. Preparing and qualifying engineers to meet the requirements of the labor market in the private and public sectors in mechanical engineering. 2. Providing distinguished academic programs in the field of mechanical engineering, both theoretical and practical, that comply with international standards of academic quality and meet the needs of the labor market. 3. Developing and improving scientific research in the fields of mechanical engineering, writing programs for numerical solution of differential equations and complex functions, data processing, digital signal analysis and control. 4. Preparing a stimulating environment for faculty members to develop their knowledge and educational and research skills. 5. Building and developing partnerships with the governmental and private sectors and the community with all its various institutions.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	**A. Knowledge and Understanding** A1- Clarify the basic concepts of Numerical Analysis and their applications in social and industrial fields. A2- Acquiring the skill in dealing with and addressing problems through the acquired sciences in this field. A3- Acquisition of basic skills to solve engineering problems. A4- Gaining experience in describing engineering problems numerically and finding related equations to solve them. **B. Subject-specific skills** B1 - The ability to solve mathematical equations numerically. B 2 - The ability to think about addressing problems according to the algorithms and methods of their work. B 3 - Writing scientific reports, reading charts, and analyzing digital data.
Indicative Contents المحتويات الإرشادية	**Roots of equations (10 hrs.)** introduction, bisection, Newton's Raphson, modified Newton's method, The secant Method, root solving as inverse interpolation **Interpolation and extrapolation (20 hrs.)** Gregory Newton interpolation, central differences, non-equally spaced data , Lagrange Polynomials, cubic spline functions, extrapolation. **Finite Difference calculus (20 hrs.)** Forward and backward Differences, higher order expressions, central differences, differences and polynomials. **Solution of algebraic equations (20 hrs.)**

	Gauss and Gauss-Jordan Elimination, Gauss siedel iteration **Curve fitting (30 hrs.)** Least squares curve fitting of discrete points, the approximation of continuous function. **Numerical Integral (10 hrs.)** Trapezoidal rule, Simpson's rule, Gauss Quadrature, dealing with singularities. **Solution of ordinary differential equations (20 hrs.)** General initial value problem, euler method, truncation error, convergence and stability, runge-kutta type formulas, predictor-corrector methods, the solution of sets of simultaneous first order differential equations. **Solution of partial differential equations (20 hrs.)** Solution of Laplace equations, Poisson's equations, 1-Dim Wave equations and 1-Dim Diffusion equation

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	**Teaching and Learning Methods** 1. Explanation and clarification through lectures. 2. Using data show, smart boards, and plasma screens. 3. Self-learning through homework and mini-projects within the lectures. 4. Laboratories. 5. Graduation projects. 6. Scientific visits. 7. Seminars held in the department. 8. Mid-term and summer training. **Assessment methods** 1. Short exams (quizzes). 2. Homework. 3. Semester and final exams for theoretical and practical subjects. 4. Small projects within the lesson. 5. Interaction within the lecture. 6. Reports

Student Workload (SWL) الحمل الدراسي للطالب

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	92	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	6
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	58	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	3.8
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	150		

Module Evaluation
تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	2	10% (10)	5, 10	LO #1, 2, 10 and 11
	Assignments	2	10% (10)	2, 12	LO # 3, 4, 6 and 7
	Projects / Lab.	1	10% (10)	Continuous	
	Report	1	10% (10)	13	LO # 5, 8 and 10
Summative assessment	**Midterm Exam**	2 hr	10% (10)	7	LO # 1-7
	Final Exam	2hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
Week 1	Fixed-point, Newton-Raphson
Week 2	Iteration method
Week 3	Gauss Elimination method
Week 4	Gauss-Jordan method
Week 5	Forward, Backward and Central differences
Week 6	Newton Interpolation
Week 7	Lagrange Interpolation
Week 8	Polynomial fitting
Week 9	Exponential and Power Fitting
Week 10	Trapezoidal and Simpson methods

Week 11	Euler method, Runge-Kutta method
Week 12	Runge-Kutta Second Order method
Week 13	Solution of Laplace Equation
Week 14	Solution of the Wave Equation
Week 15	Solution of Diffuse Equation

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Finding roots of equations
Week 2	Solution of Simultaneous Equations
Week 3	Finite Difference and Interpolation
Week 4	Lagrange Interpolation
Week 5	Curve Fitting
Week 6	Solution of Ordinary Differential Equations
Week 7	Solution of Partial Differential Equations

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	1. An Introduction to Numerical Analysis. Endre Suli. 2. Advanced Engineering Mathematics, Kreyszig, Jon Wylie and Sons. 3. Mathematical Methods for Engineers and Scientists, K. T. Tang 4. Numerical Methods, Robert W. Hornbeck, Quantum Publishers Inc.	Yes

Recommended Texts		
Websites		

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks (%)**	**Definition**
Success Group (50 - 100)	**A** - Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX** – Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Heat Transfer**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☒ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**BEM322**				
ECTS Credits	**9**				
SWL (hr/sem)	**225**				
Module Level	3		**Semester of Delivery**	6	
Administering Department	Mechanical Engineering Department		**College**	College of Engineering	
Module Leader	Falah A. Abood & Ali K. Hadi		**e-mail**	E-mail	
Module Leader's Acad. Title	Assistant Professor		**Module Leader's Qualification**	Ph.D.	
Module Tutor	Name (if available)		**e-mail**	Falah.abood@uobasrah.edu.iq	
Peer Reviewer Name	Name		**e-mail**	Ali.k.hadi@uobasrah.edu.iq	
Scientific Committee Approval Date			**Version Number**	1.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None	**Semester**	
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	The Heat Transfer Module is used by product designers, developers, and scientists who use detailed geometric models to study the influence of heating and cooling in devices and processes. It contains modeling tools for the simulation of all mechanisms of heat transfer including conduction, convection, and radiation.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	Students learn the fundamental principles of heat transfer and how they can use them to solve engineering problems, in particular in heat exchanger applications. The course, which nicely blends physical and mathematical concepts, provides an excellent support to the students for expanding/developing the analytical skills built on previous knowledge of mathematics and physics. On completion, students will demonstrate sufficient skills to enable them for their future careers, and the potential for future self-directed study in this area such as, 1. Explain the basic law of heat transfer with conduction and its applications. 2. Describe fundamental rule of conduction. 3. Apply the steady state heat transfer at on a flat wall constructed in series. 4. Derive one dimensional heat flow at constant surface temperature. 5. Derive expressions related to the heat flow in fluids and analyze a heat exchanger. 6. Calculate overall heat transfer coefficient for a heat exchanger. 7. Explain heat transfer to fluids for different flow regimes without phase change. 8. Derive the equations of heat transfer by forced convection in laminar flow. 9. Derive the equations of heat transfer by forced convection in turbulent flow. 10. Derive the equations of heat transfer in transition region between laminar and turbulent flow. 11. Explain the basic rules of heat transfer to fluids with phase change. 12. Design shell and tube heat exchangers. 13. Derive the general equation of plate type heat exchangers. 14. Explain the basic rules of radiation heat transfer.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. <u>Part A – Conduction heat transfer</u> Introduction to Heat Transfer / Basics of Heat Transfer, Methods of Heat Transfer / Conduction , Convection and Radiation, One Dimensional Steady State Heat Conduction/ plane wall, One Dimensional Steady State Heat Conduction / Cylindrical and Spherical Coordinates, Thermal Resistance Concept, Multilayer Plane Walls, Multilayered/ Cylinder Sphere, Critical Radius of Insulation, Extended Surface Heat Transfer, Two-Dimensional, Steady-State Conduction, Transient Conduction, Lumped Capacity Method, The semi-infinite solid, and Heisler Charts.

	Part B – Convection Heat Transfer Introduction to Convection Heat Transfer, The Convection Boundary Layers, Local and Average Convection Coefficients, Laminar and Turbulent Flow, The Boundary Layer Equations, Physical Interpretation of the Dimensionless Parameters, External Flow, Internal Flow, Free Convection, Boiling and Condensation, and Heat Exchangers. Part C – Radiation Heat Transfer Radiation: Processes and Properties

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Strategies: 1. Collaborative Learning. 2. Technology-Based Learning. 3. Socializing with Students Before and After Class. 4. Mixing a Variety of Instructional Strategies

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	137	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	9
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	88	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	5.8
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	225		

Module Evaluation

تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	10% (10)	5, 10	LO #1, 2, 10 and 11
	Assignments	2	10% (10)	2, 12	LO # 3, 4, 6 and 7
	Projects / Lab.	1	10% (10)	Continuous	All
	Report	1	10% (10)	13	LO # 5, 8 and 10
Summative assessment	Midterm Exam	2 hr	10% (10)	7	LO # 1-7
	Final Exam	2 hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	Introduction to Heat Transfer / Basics of Heat Transfer
Week 2	Methods of Heat Transfer / Conduction , Convection and Radiation
Week 3	One Dimensional Steady State Heat Conduction/ plane wall
Week 4	One Dimensional Steady State Heat Conduction / Cylindrical and Spherical Coordinates
Week 5	Extended Surface Heat Transfer
Week 6	Two-Dimensional, Steady-State Conduction
Week 7	Transient Conduction
Week 8	Introduction to Convection Heat Transfer
Week 9	External Flow
Week 10	Internal Flow
Week 11	Cross Flow
Week 12	Free Convection
Week 13	Boiling and Condensation
Week 14	Heat Exchangers
Week 15	Radiation heat transfer
Week 16	**Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: Calibration of Thermocouple
Week 2	Lab 2: Cross-Flow Heat Exchanger
Week 3	Lab 3: Natural Convection Heat Transfer
Week 4	Lab 4: Forced Convection Heat Transfer
Week 5	Lab 5: Radiation Heat Transfer
Week 6	Lab 6: Boiling Heat Transfer

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Fundamentals_of_Heat_and_Mass_Transfer BY: Frank P. Incropera	Yes
Recommended Texts	Heat Transfer: A Practical Approach By: Yunus A. Cengel	No
Websites	https://eng.uobasrah.edu.iq/mechanical-engineering-department	

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks (%)**	**Definition**
Success Group (50 - 100)	**A** - Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX** – Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Theory of Machine**			**Module Delivery**	
Module Type	**Core**			☒**Theory** ☒**Lecture** ☒**Lab** ☒**Tutorial** ☐**Practical** ☐**Seminar**	
Module Code	**BEM323**				
ECTS Credits	8				
SWL (hr/sem)	**200**				
Module Level		3	**Semester of Delivery**		6
Administering Department		Type Dept. Code	**College**	Type College Code	
Module Leader	Mr. Murtadha Q. Dinar		**e-mail**	Pgs2337@uobasrah.edu.iq	
Module Leader's Acad. Title		Assistant Lecturer	**Module Leader's Qualification**		MSc.
Mr. Murtadha Q. Dinar	Mr. Murtadha Q. Dinar		**e-mail**	Pgs2337@uobasrah.edu.iq	
Peer Reviewer Name		Name	**e-mail**	E-mail	
Scientific Committee Approval Date		01/06/2023	**Version Number**	1.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None	**Semester**	
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	1. Understanding the Sub-divisions of Theory of Machines and review for units, scalars and vectors. 2. Study the instantaneous centre method for finding the velocity and acceleration of various points in the mechanisms to draw the space, velocity and acceleration diagram. 3. Understanding the classification of Followers and cams, motion of the follower, displacement diagrams and construction of cam profile. 4. Understanding the principles of gyroscope and their effect on ships and aircraft. 5. Understanding the principles flywheel (Benefits and details) and study the Turning moment diagram. 6. Study the Introduction to clutches, types of clutches, instruction and its equations. 7. Understanding the principles types, applications and equation of belt drive. 8. Understanding the principles of governors (Watt, porter, Proell and Hartenall gov.) in addition to Equations & details. 9. Study the Balance of rotating masses which include: equations and details of (Static and dynamic Balance for the Same plane and different planes in Balance of rotating masses). 10. Study the Introduction to gear, types, Define, drive and its equations. 11. Understanding the automatic control of machines which include Equations of control systems (Overall Transfer Function for a system with viscous Damped Output).
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Clarify the basic concepts of theory of machines. 2. Gaining skills in graphing to solve problems and issues related to velocity and acceleration diagrams. 3. Acquisition of basic skills as an introduction to the study of Followers and cams. 4. Gain a basic understanding of how gyroscope effect on ships and aircraft. 5. The ability to gain experience in dealing flywheel and turning moment diagram. 6. Clarifying the basic concepts of clutches and belt drives in terms of types, working principle and equations. 7. Acquisition of basic skills in the study of control by means of mechanical machines (governors) of all kinds. 8. Gain a basic understanding of how to balance rotating masses. 9. The ability to know the types of gears and choose the appropriate type according to the available speed. 10. Clarify the basic concepts of automatic control of machines.

Indicative Contents المحتويات الإرشادية	• Readings, self-learning, panel discussions. • Exercises and activities in the lecture. Homework. • Directing students to some websites to benefit and develop capabilities. • Conducting seminars to explain and analyze a specific issue and find solutions to it.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	1. Explanation and clarification through lectures. 2. The method of displaying scientific materials with display devices: data projectors, smart boards, and plasma screens. 3. Self-learning through homework and mini-projects within the lectures. 4. Laboratories. 5. Graduation projects. 6. Scientific visits. 7. Seminars held in the department. 8. Summer training.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	122	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	8
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	78	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	5.2
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	200		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	2	10% (10)	5, 10	LO #1, 4, 10 and 11
	Assignments	2	10% (10)	2, 12	LO # 2, 4, 6 and 8
	Projects / Lab.	1	10% (10)	Continuous	All
	Report	1	10% (10)	13	LO # 4, 9 and 11
Summative assessment	**Midterm Exam**	2 hr	10% (10)	7	LO # 1-6
	Final Exam	2 hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Introduction on theory of machine and velocity diagram (Simple crank mech).
Week 2	Velocity diagram (slider and slot). Acceleration diagram (Simple crank mech).
Week 3	Acceleration diagram (slider and slot).
Week 4	cams and followers, cam and follower strokes (Uniform velocity and SHM).
Week 5	Cam and follower diagrams two scale.
Week 6	Gyroscopic and gyroscopic applications.
Week 7	Flywheels and Turning moment diagrams (benefits, details, equations and applications)
Week 8	Clutches (Types and equations).
Week 9	Belt drive (Introductions for types, applications and equations).
Week 10	Governors (Introductions for types and applications). Watt and porters gov.
Week 11	Proell and Hartenall governors.
Week 12	Balance of rotating masses (Static and dynamic balance of rotating masses)
Week 13	Same and different planes in balance of rotating masses
Week 14	Introductions for types and applications of Gear
Week 15	Automatic control of machines.
Week 16	**Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1-2	Simple crank mechanism
Week 3-4	Cams and Follower
Week 5-6	Flywheel
Week 7-8	Gyroscope
Week 9-10	Governor
Week 11-12	Balances of rotating masses
Week 13-14-15	Practical test for students in one of the experiments
Week 16	**Preparatory week before the final Exam**

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Theory of machines. London, E. Arnold.	Yes
Recommended Texts	Theory of Machines by RS Khurmi and JK Gupt	No
Websites		

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks (%)**	**Definition**
Success Group (50 - 100)	**A** - Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX** – Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Design of Machine Elements I**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☒ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	BEM 324				
ECTS Credits	**7**				
SWL (hr/sem)	**175**				
Module Level	3		**Semester of Delivery**	6	
Administering Department			**College**		
Module Leader	Ali H. Zaibel		**e-mail**	Ali.zaibel@uobasrah.edu.iq	
Module Leader's Acad. Title	Lecturer		**Module Leader's Qualification**	Ph.D.	
Module Tutor	Ali H. Zaibel		**e-mail**	Ali.zaibel@uobasrah.edu.iq	
Peer Reviewer Name			**e-mail**		
Scientific Committee Approval Date	01/06/2023		**Version Number**	1.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	Strength of material	**Semester**	3
Co-requisites module	Engineering mechanics -statics	**Semester**	1

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	1. Provide an education that builds within students a solid foundation in mechanical engineering principles 2. Prepares graduates who have the motivation and ability for lifelong growth in their professional careers 3. Understand the mechanical engineering design elements enough to commit to major designs and create a career plan 4. To teach students how to apply mechanical engineering design theory to identify and quantify machine elements in the design of commonly used mechanical systems
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Clarify the basic concepts in the design of machines through the design of mechanical elements and components. 2. Acquisition of skills in dealing with engineering problems and issues. 3. Acquisition of basic skills as introductions to building mechanical designs. 4. Gain a basic understanding of how mechanical systems work in various industrial applications. 5 The ability to design applied mechanical problems. 6 The ability to think about solving a specific engineering problem or problem. 7 Writing scientific reports. 8 The ability to gain experience in dealing with mechanical systems
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. Stress analysis: Stress types, Mohr circle and definition of Principal stresses Curved beams: Neutral axis calculation and Calculation of maximum stresses Static loading: Basic definition and Failure theories: 1. ductile materials: Rankine, Tresca and Von- Mises theories 2. brittle materials: Rankine, Mohr and modified Mohr theories Fatigue loading: 1. basic definition, concept of Fatigue test, S-N curve and endurance limit. 2. Modification factors: Correction of endurance limit for real environmental conditions 3. Failure theories for dynamic loading: Goodman diagram and Calculation of safety factors. Spring :

	1. spring types, Basic definitions and terminology. 2. Stress analysis: maximum Shear stress, spring stiffness, spring materials and strengths 3. dynamic loading, Estimate spring life and safety factor.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials and by considering type of simple experiments involving some sampling activities that are interesting to the students.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	107	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	7
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	68	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	4.5
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	175		

Module Evaluation

تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	10% (10)	5, 10	LO #1, 4, 10 and 11
	Assignments	2	10% (10)	2, 12	LO # 2, 4, 6 and 8
	Projects / Lab.	1	10% (10)	Continuous	All
	Report	1	10% (10)	13	LO # 4, 9 and 11
Summative assessment	Midterm Exam	2 hr	10% (10)	7	LO # 1-6
	Final Exam	2 hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	Stress analysis, Stress types, Mohr circle
Week 2	Stress analysis, Principal stresses
Week 3	Curved beams, Neutral axis calculation
Week 4	Curved beams, Calculation of maximum stresses
Week 5	Static loading, basic definition
Week 6	Failure theories, ductile materials: Rankine, Tresca and Von- Mises theories
Week 7	Failure theories, brittle materials: Rankine, Mohr and modified Mohr theories
Week 8	Fatigue loading: basic definition
Week 9	Fatigue test, S-N curve and endurance limit
Week 10	Modification factors: Correction of endurance limit for real environmental conditions
Week 11	Failure theories: Goodman diagram and Calculation of safety factors
Week 12	Spring types, Basic definitions and terminology

Week 13	Stress analysis: max. Shear stress, spring stiffness
Week 14	Spring materials and strengths
Week 15	Springs: dynamic loading, Estimate spring life and safety factor
Week 16	**Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: deflection of undetermined beams
Week 2	Lab 2: deflection of continuous beams
Week 3	Lab 3: deflection of curved beams
Week 4	Lab 4: Fatigue test
Week 5	Lab 5: thick cylinders
Week 6	Lab 6: thin cylinders
Week 7	Lab 7: application of strain gauges

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Shigley's Mechanical Engineering Design 10th Edition by Richard Budynas and Keith Nisbett	Yes
Recommended Texts	An Introduction to Mechanical Engineering 4th Edition by Jonathan Wickert and Kemper Lewis	No
Websites	https://nptel.ac.in/courses/112/105/112105124/	

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks (%)**	**Definition**
Success Group (50 - 100)	**A -** Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX –** Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Design of Machine Elements II**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☒ **Lecture** ☐ **Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	BEM 411				
ECTS Credits	**4**				
SWL (hr/sem)	**100**				
Module Level	4		**Semester of Delivery**	7	
Administering Department			**College**		
Module Leader	Ali H. Zaibel		**e-mail**	Ali.zaibel@uobasrah.edu.iq	
Module Leader's Acad. Title	Lecturer		**Module Leader's Qualification**	Ph.D.	
Module Tutor	Ali H. Zaibel		**e-mail**	Ali.zaibel@uobasrah.edu.iq	
Peer Reviewer Name			**e-mail**		
Scientific Committee Approval Date	15/06/2023		**Version Number**		

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module		**Semester**	
Co-requisites module		**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	1. Provide an education that builds within students a solid foundation in mechanical engineering principles 2. Prepares graduates who have the motivation and ability for lifelong growth in their professional careers 3. Understand the mechanical engineering design elements enough to commit to major designs and create a career plan 4. To teach students how to apply mechanical engineering design theory to identify and quantify machine elements in the design of commonly used mechanical systems
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Clarify the basic concepts in the design of machines through the design of mechanical elements and components. 2. The ability to gain experience in dealing with mechanical elements 3. Acquisition of basic skills as introductions to building mechanical designs. 4. Gain a basic understanding of how mechanical systems work in various industrial applications. 5. The ability to design applied mechanical problems. 6. The ability to think about solving a specific engineering problem or problem. 7. Writing scientific reports. 8. The ability to gain experience in dealing with mechanical systems
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. Introduction to screws and fasteners Power screw: efficiency of power screws Bolted joints in tension: Load ratio between bolt and members Bolted joints in shear- eccentric, Calculation of load carried by each bolt Dynamic loading in tensile joints, Load safety factor and separation safety factor Introduction to welding: Welding codes and types Welding joints: analysis in shear stress Welding joints: analysis in bending stress Introduction to gears: Gear types and definitions Gears interaction, definition of gear train, Conjugate action and involute properties and gear teeth forming, gear trains Force analysis, spur gears and helical gears Calculation of stress using AGMA equation

	Types of rolling contact bearing, bearing life, Rating life, selection of bearing

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials and by considering type of simple experiments involving some sampling activities that are interesting to the students.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	62	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	38	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	2.5
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	100		

Module Evaluation

تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	10% (10)	5, 10	LO #1, 4, 10 and 11
	Assignments	2	10% (10)	2, 12	LO # 2, 4, 6 and 8
	Projects / Lab.	1	10% (10)	Continuous	All
	Report	1	10% (10)	13	LO # 4, 9 and 11
Summative assessment	Midterm Exam	2 hr	10% (10)	7	LO # 1-6
	Final Exam	2 hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	Introduction to screws and fasteners
Week 2	Efficiency of power screws
Week 3	Bolted joints in tension: Load ratio between bolt and members
Week 4	Bolted joints in shear- eccentric
Week 5	Dynamic loading in tensile joints
Week 6	Introduction to welding: Welding codes and types
Week 7	Welding, joint analysis in shear stress
Week 8	Welding, joint analysis in bending stress
Week 9	Introduction to gears: Gear types and definitions
Week 10	Conjugate action, involute properties
Week 11	Contact ratios, gear teeth forming, gear trains
Week 12	Force analysis, spur gears and helical gears
Week 13	Calculation of stress using AGMA equation
Week 14	Types of rolling contact bearing, bearing life

Week 15	Rating life, selection of bearing
Week 16	**Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Shigley's Mechanical Engineering Design 10th Edition by Richard Budynas and Keith Nisbett	Yes
Recommended Texts	An Introduction to Mechanical Engineering 4th Edition by Jonathan Wickert and Kemper Lewis	No
Websites	https://nptel.ac.in/courses/112/105/112105124/	

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks (%)**	**Definition**
Success Group (50 - 100)	**A** - Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX** – Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Engineering Materials**			**Module Delivery**	
Module Type	**Core**			☒**Theory** ☒**Lecture** ☐ **Lab** ☐ **Tutorial** ☐**Practical** ☐**Seminar**	
Module Code	**BEM412**				
ECTS Credits	**4**				
SWL (hr/sem)	**100**				
Module Level	4		**Semester of Delivery**	7	
Administering Department	Type Dept. Code		**College**	Type College Code	
Module Leader	Dr. Murtadha A. Jabbar		**e-mail**	murtadha.jabbar@uobasrah.edu.iq	
Module Leader's Acad. Title	Assistant Professor		**Module Leader's Qualification**	Ph.D.	
Dr. Murtadha A. Jabbar	Dr. Murtadha A. Jabbar		**e-mail**	murtadha.jabbar@uobasrah.edu.iq	
Peer Reviewer Name	Name		**e-mail**	E-mail	
Scientific Committee Approval Date	01/06/2023		**Version Number**	1.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None	**Semester**	
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	Identifying the ferrous and non-ferrous materials, their properties and applications 2. Studying of ceramic materials. 3. Studying polymers and identifying their mechanical properties 4. Studying of composite materials and address their mechanical properties. 5. Describe the mechanism of crack propagation for both ductile and brittle modes of fracture. Define fracture toughness 6. Define fatigue and specify the conditions under which it occurs. Determine the fatigue lifetime and the fatigue strength. 7. Define creep and specify the conditions under which it occurs. Determine the steady-state creep rate, and the rupture lifetime. 8. Understanding of the mechanisms of corrosion and corrosion prevention.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Understand the structures, properties and applications of metals, ceramics, polymer and composite materials. 2. Proper materials selection for engineering applications. 3. diagnosis of cause(s) and mechanisms of failure. 4. Understanding the mechanisms of failure such as fracture, fatigue, creep or corrosion 5. The philosophy of performing failure analysis and steps involved in failure analysis investigations 6. Case studies on documented engineering failures and failure analysis reports will be discussed.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. **Part A – Engineering Materials** 1.Clarify the basic concepts of engineering materials and their classification 2.The ability to know the classifications of engineering materials. 3. The ability to think about choosing the appropriate materials for engineering applications. 4. The ability to gain experience in dealing with changes that occur to engineering materials as a result of different operating conditions **Part B – Failure Analysis** 1. The ability to calculate the mechanical properties of engineering materials. 2. The ability to think about the treatment of various failure problems. 3. Writing scientific reports. 4. The ability to gain experience in dealing with corrosion protection systems

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	1. Explanation and clarification through lectures. 2. The method of displaying scientific materials with display devices: data projectors, smart boards, and plasma screens. 3. Self-learning through homework and mini-projects within the lectures. 4. Laboratories. 5. Graduation projects. 6. Scientific visits. 7. Seminars held in the department. 8. Summer training.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	62	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	38	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	2.5
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	100		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	2	10% (10)	5, 10	LO #1, 2, 4and 5
	Assignments	2	10% (10)	4, 12	LO # 1, 2, 3 and 6
	Projects	1	10% (10)	Continuous	All
	Report	1	10% (10)	13	LO # 2, 4 and 6
Summative assessment	**Midterm Exam**	2 hr	10% (10)	7	LO # 1,3
	Final Exam	2 hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Nomenclature of Ferrous Alloys, Low Carbon steel, Medium Carbon Steel, High Carbon Steel, Effects of Alloying Elements on Steel,
Week 2	Low Alloy Steels, Stainless-Steels, Heat Treatment of Steels, Cast Irons
Week 3	Light Metals, Heavy Metals, Refractory Metal, Precious Metals, Precipitation Hardening
Week 4	Spectrum of Ceramics Uses, Ceramic Crystal Structures, Properties of Ceramics
Week 5	Mechanical Properties Stress –Strain Behavior (Flexural Strength), Traditional Ceramics, Advanced Ceramics
Week 6	Classification of polymers, Synthetic of Polymers, Mechanical Properties, Viscoelasticity, Viscoelastic Creep
Week 7	Classification of Composite Materials According to Type of Reinforcement and Matrix Type of constituents, Particle reinforced composite materials
Week 8	Properties of Composites Rule of mixtures Fiber reinforced composite materials Types of fibers, Structural composite materials
Week 9	Elastic Deformation, Stress-Strain Behavior, Tensile Properties, True Stress and Strain, Hardness.
Week 10	Fundamentals of Fracture, Ductile Fracture, Brittle Fracture, Principles of Fracture Mechanics, and Impact Fracture Testing
Week 11	Cyclic Stresses, the S–N Curve, Crack Initiation and Propagation, Factors that Affect Fatigue Life
Week 12	Environmental Effects Generalized Creep Behavior, Stress and Temperature Effects
Week 13	Data Extrapolation Methods (Larson- Miller Methods), Alloys for High-Temperature Use
Week 14	Electrochemical Considerations, Forms of Corrosion
Week 15	Forms of Corrosion, Corrosion Prevention, wear
Week 16	**Preparatory week before the final Exam**

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	1. Materials Science and Engineering, William D. Callister 2. The Science and Engineering of Materials by D. R. Askeland, and P. Phule	Yes
Recommended Texts	Mechanical Behavior of Materials M.A. Meyers and K. K. Chawla	No
Websites	https://aerospaceweb.org/design/scripts/compress.shtml	

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks (%)**	**Definition**
Success Group (50 - 100)	**A -** Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX –** Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Power Plants**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☒ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**BEM413**				
ECTS Credits	**8**				
SWL (hr/sem)	**200**				
Module Level	4		**Semester of Delivery**	7	
Administering Department	Type Dept. Code		**College**	Type College Code	
Module Leader	Dr Ahmad Abdulkarim Mahdi		**e-mail**	Ahmad.mahdi@uobasrah.edu.iq	
Module Leader's Acad. Title	Lecturer		**Module Leader's Qualification**	Ph.D.	
Module Tutor	Name (if available)		**e-mail**	E-mail	
Peer Reviewer Name	Name		**e-mail**	E-mail	
Scientific Committee Approval Date	01/06/2023		**Version Number**	1.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None	**Semester**	
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	1. Graduating engineers specialized in the fields of power plant in line with the progress made in the field of power plants including the clean energy power plant. 2. Providing the labor market with engineers capable to deal with modern power plant. 3. Coordination of work with researchers in power plant as groups to advance the reality of scientific research in this field. 4. Producing projects and applicable research, and marketing.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Knowledge and Understanding A1- Establishing the basic principles of thermodynamics. A2- Identifying the types of conventional and non-conventional electric power stations. A3- Explanation and clarification of modern methods of power stations.. A4- Use of alternative and environmentally friendly stations. 2. B. Subject-specific skills B1- The possibility of studying power stations and identifying their parts. B2 - Gaining high confidence in the ability to operate and design power stations.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. <u>1. General introduction on power plants [20 hrs]</u> Review of the important basics of thermodynamics, fluid mechanics and heat transfer. Definition of the important concepts and classification of power plants, Principle of work of conventional power plants (steam, gas, nuclear, diesel and hydro power plants). Principle of work of the important nonconventional power plants (fuel cells, PV cells, biogas power, geothermal energy, ocean energy, wind energy, wave energy and tidal energy). <u>2. Gas turbine power plants [20 hrs]</u> Types of gas turbine cycles, principle of work, advantage and disadvantage of gas turbine unit. Thermodynamics and performance analysis of simple gas turbine cycle. Modifications to the basic cycle Performance analysis of the modified cycle (reheat, regenerative and multi-stage compression with inter-cooling. <u>Steam turbine power plants [20 hrs]</u> Steam power plant cycles (Carnot cycle, ideal Rankin cycle and actual Rankin cycle.

	Thermodynamics and performance analysis of simple steam turbine cycle. Modifications to the simple Rankin cycle . Rankin cycle with superheat. The reheat Rankin cycle The regenerative Rankin cycle Combined gas steam power plants <u>Boilers [20 hrs]</u> Classifications of steam generators, Boiler coils and equipments and the requirements of good boiler. Principle of work of fire tube, water tube and heat recovery boilers Boiler calculations and performance <u>Condensers [20 hrs]</u> Types of condensers, Elements of the steam condenser, air ejectors and the requirements of an efficient condenser. Steam condenser performance analysis. <u>Steam turbine [20 hrs]</u> The impulse steam turbine velocity diagrams. Pressure and velocity compounded impulse steam turbine. The axial - flow reaction turbines Optimum operating conditions from blade velocity diagrams. Turbine blade height and design

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	1. Use of recorded video clips. 2. Direct attendance lectures. 3. Laboratories and practical experiments. 4. Practical projects. 5. Using modern display methods such as smart screens. 6. Scientific visits. 7. Seminars held in the department. 8. Preparing lectures using modern programs.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	122	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	8
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	78	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	5.2
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	200		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	2	10% (10)	5, 10	LO #A1, to B2
	Assignments	2	10% (10)	2, 12	LO #A1, to B2
	Projects / Lab.	1	10% (10)	Continuous	All
	Report	1	10% (10)	13	LO #B1 to B2
Summative assessment	**Midterm Exam**	2 hr	10% (10)	7	LO #A1 to A4
	Final Exam	2 hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Introduction - Review of the important basics of thermodynamics, fluid mechanics and heat transfer.
Week 2	Definition of the important concepts and classification of power plants
Week 3	Classification of power plants
Week 4	Gas turbine power plants, Types of gas turbine cycles, principle of work, advantage and disadvantage
Week 5	Types of gas turbine cycles, principle of work, advantage and disadvantage
Week 6	Performance analysis of the modified cycle
Week 7	Mid-term Exam Performance analysis of the modified cycle
Week 8	Classifications of steam generators

Week 9	Boiler calculations and performance
Week 10	Boiler calculations and performance
Week 11	Types of condensers, Elements of the steam condenser
Week 12	Steam condenser performance analysis
Week 13	Steam condenser performance analysis
Week 14	The impulse steam turbine velocity diagrams
Week 15	**Optimum operating conditions of turbine**
Week 16	**Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: Power plant components
Week 2	Lab 2: Evaluate the power plant efficiency
Week 3	Lab 3: Evaluate the steam turbine efficiency
Week 4	Lab 4: Evaluate the Gas turbine efficiency
Week 5	Lab 5: Nozzles
Week 6	Lab 6: Condenser efficiency
Week 7	Lab 7: Boiler efficency

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	POWER PLANT ENGINEERING A.K. Raja	Yes
Recommended Texts	Applied Thermodynamic For Engineering By Onkar Singh	Yes
Websites	https://www.coursera.org/browse/physical-science-and-engineering	

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks (%)**	**Definition**
Success Group (50 - 100)	**A -** Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX –** Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Control & Measurements**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☒ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**BEM414**				
ECTS Credits	**9**				
SWL (hr/sem)	**225**				
Module Level	4		**Semester of Delivery**	7	
Administering Department	Mechanical		**College**	Engineering	
Module Leader	Imad A. Kheioon		**e-mail**	Imad.kheioon@uobasra.edu.iq	
Module Leader's Acad. Title	lecturer		**Module Leader's Qualification**	Ph.D.	
Module Tutor	Name (if available)		**e-mail**	E-mail	
Peer Reviewer Name	Name		**e-mail**	E-mail	
Scientific Committee Approval Date	01/06/2023		**Version Number**	1.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None	**Semester**	
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	1. Graduating engineering cadres specialized in the fields of mechanical engineering in line with the progress made in the field of controlling devices and equipment. 2. Providing the labor market with cards that have the ability to deal with modern control techniques in the fields of electric power production, oil and heavy equipment. 3. Work in scientific research in the field of controlling engine speed, pressure, distances and production lines in factories. 4. Coordination of work with researchers in control techniques as groups in order to advance the reality of scientific research in this field. 5. Producing projects, targeted and applicable research, and marketing. 6. Graduating engineering cadres specialized in the fields of mechanical engineering in line with the progress made in the field of measuring variables in devices and equipment. 7. Providing the labor market with cards that have the ability to deal with modern measuring equipment techniques in the fields of mechanical engineering. 8. Work in scientific research in the field of measurement and analysis of data in laboratory and practical results. 9. Coordination of work with researchers in measurement techniques as groups in order to advance the reality of scientific research in this field.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1-Establishing the basic principles of control systems. 2- Building advanced models of modern control systems. 3- Designing control systems for devices and equipment. 4- Maintenance of control systems. 5- Developing old control systems. 6- Explanation and clarification of modern methods of control systems. 7- The use of artificial intelligence techniques in control systems. 8- Establishing the basic principles of measurement systems. 9- Building advanced models for modern measurement systems. 10- Designing measuring systems for devices and equipment. 11- Maintenance of measurement systems. 12- Developing old measurement systems. 13- Explanation and clarification of modern methods of measurement systems. 14- Use of artificial intelligence techniques in measurement systems.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. • Reading the relevant books in the field of the course. • Discussion within the lesson. • Solve some advanced issues. • Searching websites. • Attending scientific conferences.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Activating the participation of students. Paying attention to the student's desire to accept the lesson material. Evaluation of the students interacting in the lesson. Presenting practical examples that interest the students for the lesson. Presenting various topics to keep the recipient away from boredom and boredom.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	137	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	9
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	88	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	5.8
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	225		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	2	10% (10)	5, 10	LO #1, 2, 10 and 11
	Assignments	2	10% (10)	2, 12	LO # 3, 4, 6 and 7
	Projects / Lab.	1	10% (10)	Continuous	All
	Report	1	10% (10)	13	LO # 5, 8 and 10
Summative assessment	**Midterm Exam**	2 hr	10% (10)	7	LO # 1-7
	Final Exam	2 hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Introduction to control system + Measurement Systems
Week 2	Laplace transform+ Measurement Errors

Week 3	Modeling of dynamic systems+ Modeling Measurement Systems
Week 4	Modeling of liquid level control systems+ Sensors
Week 5	Modeling of pneumatic control systems+ Sensors
Week 6	Modeling of hydraulic control systems+ Microsensors
Week 7	Modeling of heat control systems+ Microsensors
Week 8	Second order system+ Signal Conditioning And Processing
Week 9	Stability+ Signal Conditioning And Processing
Week 10	Steady state errors+ Signal Conditioning And Processing
Week 11	Root locus+ Force, Torque, Pressure And Strain Measurement
Week 12	Root locus+ Force, Torque, Pressure And Strain Measurement
Week 13	Root locus+ Force, Torque, Pressure And Strain Measurement
Week 14	Frequency response analyses+ Position And Motion Measurement
Week 15	Bode diagram+ Position And Motion Measurement
Week 16	Bode diagram+ Flow And Temperature Measurement

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: On-off control
Week 2	Lab 2: PID control
Week 3	Lab 3: calibration
Week 4	Lab 4: Experimental errors
Week 5	Lab 5: strain gauge
Week 6	Lab 6: I-P convert
Week 7	Lab 7: liquid level control

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	1- Measurement and Instrumentation Systems By W. Bolton 2- Modern control engineering By Katsuhiko Ogata	Yes
Recommended Texts	1- Principles of control systems by S.P.Eugene 2- Linear control systems with MATLAB applications by B.S. Manke	No
Websites		

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks (%)**	**Definition**
Success Group (50 - 100)	**A** - Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX** – Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Renewable Energy**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☒ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**BEM421**				
ECTS Credits	**4**				
SWL (hr/sem)	**100**				
Module Level	4		**Semester of Delivery**	8	
Administering Department	Type Dept. Code		**College**	Type College Code	
Module Leader	Dr.Salman H.Hammadi		**e-mail**	Salman.hammadi@uobasrah.edu.iq	
Module Leader's Acad. Title	Professor		**Module Leader's Qualification**	Ph.D.	
Module Tutor	Name (if available)		**e-mail**	E-mail	
Peer Reviewer Name	Name		**e-mail**	E-mail	
Scientific Committee Approval Date	01/06/2023		**Version Number**	1.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	Thermodynamics, Heat transfer, fluid mechanics	**Semester**	
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	1. Preparing engineers for meeting the labor market in the field of renewable energy 2. Encouraging and developing scientific research in the fields of mechanical engineering, especially renewable energy systems. 3. Preparing a suitable environment for faculty members to develop their knowledge and research skills.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1 - The ability to design a renewable energy system 2 – Understanding renewable energy system
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. <u>Part A – Solar Energy</u> Introduction of thermodynamics, energy, work, entropy, available energy, exergy, the principle of solar energy, solar radiation estimation, solar collectors, solar chimney power plant, solar tower power plant, solar water heater, solar air heater, solar still. (30 hrs.) <u>Part B –Other renewable energies</u> Wind energy, wind turbine, geothermal energy, tidal energy, wave energy. (15 hrs.)

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Type something like: The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials, and by considering types of simple experiments involving some sampling activities that are interesting to the students.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	62	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	5
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	38	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	2.5
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	100		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	2	10% (10)	5, 10	LO #1, 2, 10 and 11
	Assignments	2	10% (10)	2, 12	LO # 3, 4, 6 and 7
	Projects	1	10% (10)	Continuous	All
	Report	1	10% (10)	13	LO # 5, 8 and 10
Summative assessment	**Midterm Exam**	2 hr	10% (10)	7	LO # 1-7
	Final Exam	2 hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Introduction of thermodynamics
Week 2	Available energy and exergy concept
Week 3	Fundamental of solar radiation
Week 4	Estimation of solar radiation
Week 5	Solar collectors
Week 6	Solar updraft power plant
Week 7	Concentrating solar thermal power plant
Week 8	Solar water heating system
Week 9	Solar air heater system

Week 10	Solar Desalination system
Week 11	Wind energy
Week 12	Wind turbine
Week 13	Geothermal Energy
Week 14	Tidal energy
Week 15	Wave energy
Week 16	**Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	
Week 2	
Week 3	
Week 4	

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Fundamentals of Renewable Energy Processes, Fourth Edition (Instructors Edu Resource 1 of 2 (Aldo Vieira da Rosa, Juan Carlos Ordonez	No
Recommended Texts	Solar Energy Engineering Processes And Systems-Academic Press (2009)	No
Websites	Understanding Renewable Energy Systems (Volker Quaschning)	

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks (%)**	**Definition**
Success Group (50 - 100)	**A -** Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX –** Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Industrial Engineering and Management**			**Module Delivery**	
Module Type	**Support**			☒ **Theory** ☒ **Lecture** ☐ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**BEM422**				
ECTS Credits	**5**				
SWL (hr/sem)	**125**				
Module Level	4		**Semester of Delivery**	8	
Administering Department	Type Dept. Code		**College**	Type College Code	
Module Leader	Name		**e-mail**	E-mail	
Module Leader's Acad. Title	Professor		**Module Leader's Qualification**	Ph.D.	
Module Tutor	Name (if available)		**e-mail**	E-mail	
Peer Reviewer Name	Name		**e-mail**	E-mail	
Scientific Committee Approval Date	01/06/2023		**Version Number**	1.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None	**Semester**	
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	1. Develop knowledge of industrial engineering principles. 2. Foster an understanding of project management principles. 3. Enhance problem-solving and analytical skills. 4. Develop critical thinking and decision-making abilities. 5. Cultivate effective communication and teamwork skills. 6. Promote ethical and sustainable practices.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Apply industrial engineering principles to optimize processes and systems for enhanced productivity and efficiency. 2. Utilize project management techniques to plan, execute, and monitor projects effectively, meeting specified goals and deadlines. 3. Analyze and improve work design to enhance employee productivity, satisfaction, and safety. 4. Implement quality management techniques to ensure high standards and continuous improvement. 5. Employ operations research methods to solve complex problems and make data-driven decisions. 6. Demonstrate proficiency in supply chain management, optimizing the flow of goods and resources. 7. Utilize facility layout strategies to optimize space utilization and streamline operations. 8. Evaluate and mitigate risks associated with projects, ensuring successful project completion. 9. Estimate project costs accurately, manage budgets, and monitor financial performance. 10. Demonstrate effective communication, leadership, and teamwork skills in industrial and project management settings.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. <u>Part A – Industrial Engineering [30 hr]</u> Operation research Maintenance Engineering Fundamentals of Control: INVENTORY MANAGEMENT AND CONTROL Fundamentals of Control: INVENTORY MANAGEMENT AND CONTROL Break Even Analysis Sequencing Introduction to Transportation Problem Introduction to Transportation Problem

	Assignment Problem Assignment Problem Games with Mixed Strategies Introduction to Linear Programming Introduction to Linear Programming <u>Part B – Project Management [30 hr]</u> Fundamentals Project Initiations Planning Activity Networks Activity Networks- -examples Project Resource Analysis Project Resource Analysis examples SOLVED PROBLEMS Risk Management Risk Management examples NPV NPV EXAMPLES COST MANAGMNET Cost management examples

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The strategies employed in the Industrial Engineering and Management module focus on promoting active student participation and cultivating critical thinking skills. This is achieved through interactive classes, engaging tutorials, and the inclusion of practical experiments. The module incorporates sampling activities that are designed to captivate students' interest and align with the principles of industrial engineering and project management. By encouraging participation and hands-on learning, students develop their analytical abilities and gain a deeper understanding of the subject matter. These strategies create an engaging and dynamic learning environment that prepares students for real-world challenges in the field of industrial engineering and project management.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	77	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	5
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	48	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	3.2
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	125		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	2	10% (10)	5, 10	LO #1, 2, 10 and 11
	Assignments	2	10% (10)	2, 12	LO # 3, 4, 6 and 7
	Projects / Lab.	1	10% (10)	Continuous	All
	Report	1	10% (10)	13	LO # 5, 8 and 10
Summative assessment	**Midterm Exam**	2 hr	10% (10)	7	LO # 1-7
	Final Exam	2 hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Introduction. Operation research
Week 2	Maintenance Engineering, Fundamentals of Control: INVENTORY MANAGEMENT AND CONTROL
Week 3	Fundamentals of Control: INVENTORY MANAGEMENT AND CONTROL, Break Even Analysis
Week 4	Sequencing, Introduction to Transportation Problem
Week 5	Introduction to Transportation Problem, Assignment Problem
Week 6	Assignment Problem, Games with Mixed Strategies
Week 7	Introduction to Linear Programming, Introduction to Linear Programming
Week 8	Introduction to project Management , Project Initiations
Week 9	Planning, Activity Networks

Week 10	Activity Networks- -examples, Project Resource Analysis
Week 11	Project Resource Analysis examples, SOLVED PROBLEMS
Week 12	Risk Management, Risk Management examples
Week 13	NPV, NPV EXAMPLES
Week 14	COST MANAGMNET, Cost management examples
Week 15	Solved problems
Week 16	**Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	
Week 2	
Week 3	
Week 4	
Week 5	
Week 6	
Week 7	

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Lectures for Industrial Engineering and Management	Yes
Recommended Texts		
Websites		

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks (%)**	**Definition**
Success Group (50 - 100)	**A -** Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX –** Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Air conditioning and refrigeration**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☒ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**BEM423**				
ECTS Credits	**8**				
SWL (hr/sem)	**200**				
Module Level	4		**Semester of Delivery**	8	
Administering Department	Type Dept. Code		**College**	Type College Code	
Module Leader	Dr.Salman H.Hammadi		**e-mail**	Salman.hammadi@uobasrah.edu.iq	
Module Leader's Acad. Title	Professor		**Module Leader's Qualification**	Ph.D.	
Module Tutor	Name (if available)		**e-mail**	E-mail	
Peer Reviewer Name	Name		**e-mail**	E-mail	
Scientific Committee Approval Date	01/06/2023		**Version Number**	1.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	Thermodynamics, Heat transfer, fluid mechanics	**Semester**	
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	1. Preparing engineers for meeting the labor market needs of private and public sectors in the mechanical engineering field through diversifying the methods of learning, teaching, and training for the students. 2. Providing academic programs in the field of mechanical engineering, both theoretical and practical, according to the international standards of academic quality and the needs of the labor market. 3. Encouraging and developing scientific research in the fields of mechanical engineering in the fields of air conditioning and thermal performance of buildings. 4. Preparing a suitable environment for faculty members to develop their knowledge and research skills.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1 - The ability to design air conditioning systems. 2 - The ability to think about addressing the problems of the large heat gain in buildings during the summer. 3 - The ability to deal with modern software for cooling load calculations and designing air duct systems and chilled or hot water pipes in central air conditioning systems.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. <u>Part A – Air conditioning</u> Introduction of moist air properties, Relative humidity, moisture content, Relative humidity, moisture content, Air conditioning processes, and psychometric chart, Sensible and latent heat, Humidification, and dehumidification of air, Adiabatic mixing, and adiabatic saturation, Summer air conditioning systems, Cooling load estimation, Steady state heat conduction in buildings, Unsteady state heat conduction in buildings, Cooling load items, examples and applications, Heating load estimation, Duct design, [80 hrs.] <u>Part B – Refrigeration</u> System of air conditioning, Pipe system design, Chillers, Refrigeration, Vapor compression refrigeration system, Carnot refrigeration cycle, Ideal refrigeration cycle, Real vapor compression refrigeration cycle, Absorption refrigeration system, Steam jet refrigeration, Air cycle refrigeration, Cold storage.[40 hrs.]

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Type something like: The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials, and by considering types of simple experiments involving some sampling activities that are interesting to the students.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	137	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	8
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	63	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	4.2
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	200		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	2	10% (10)	5, 10	LO #1, 2, 10 and 11
	Assignments	2	10% (10)	2, 12	LO # 3, 4, 6 and 7
	Projects / Lab.	1	10% (10)	Continuous	All
	Report	1	10% (10)	13	LO # 5, 8 and 10
Summative assessment	**Midterm Exam**	2 hr	10% (10)	7	LO # 1-7
	Final Exam	2 hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Introduction of moist air properties
Week 2	Air conditioning processes and psychometric chart
Week 3	Summer air conditioning systems
Week 4	Cooling load estimation
Week 5	Heat conduction in buildings
Week 6	Cooling load items, examples, and applications
Week 7	Heating load estimation
Week 8	Ducts design
Week 9	Systems of air conditioning
Week 10	Pipes system design
Week 11	Ideal refrigeration cycles
Week 12	Vapor compression refrigeration cycle
Week 13	Absorption refrigeration system
Week 14	Steam jet and Air refrigeration cycles
Week 15	Unconventional refrigeration system and cold storage
Week 16	**The preparatory week before the Final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: Introduction to moist air properties
Week 2	Lab 2: psychometric processes
Week 3	Lab 3: cooling and dehumidification
Week 4	Lab 4: Heating and humidification
Week 5	Lab 5: Air distribution system
Week 6	Lab 6: vapor compression refrigeration system
Week 7	Lab 7: Heat pump

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Air conditioning engineering Fifth edition, W.P.Jones	Yes
Recommended Texts	Handbook of air conditioning and Refrigeration Shan K. Wang	No
Websites	Refrigeration and air condition C.P. Arora	

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks (%)**	**Definition**
Success Group (50 - 100)	**A -** Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX –** Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Theory of Vibrations**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☒ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**BEM424**				
ECTS Credits	**8**				
SWL (hr/sem)	**200**				
Module Level	4		**Semester of Delivery**	8	
Administering Department	Mechanical		**College**	Engineering	
Module Leader	Abdulbaseer S. Bahedh		**e-mail**	abdalbaseer.baheth@uobasrah.edu.iq	
Module Leader's Acad. Title	Assist. Professor		**Module Leader's Qualification**	Ph.D.	
Module Tutor	-		**e-mail**	E-mail	
Peer Reviewer Name	Name		**e-mail**	E-mail	
Scientific Committee Approval Date	01/06/2023		**Version Number**	1.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None	**Semester**	
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	1. Acquisition of skills in dealing with engineering problems and issues related to vibrations. 2. Acquiring basic skills as an introduction to understanding the principles of vibration. 3. Gain a basic understanding of how vibrations occur in various industrial applications. 4. Preparing and qualifying specialized specialists for the requirements of the labor market in the private and public sectors in mechanical engineering through diversification in the methods of learning and teaching and training students to apply the acquired knowledge and skills in mathematics. 5. Providing distinguished academic programs in the theoretical and practical fields of mechanical engineering and international quality rules that meet the needs of the labor market. 6. The emergence of scientific research in the field of mechanical engineering, vibrations in general, the principles of vibration theory, and how vibrations are generated in parts. 7. Preparing a stimulating environment for faculty members to develop their knowledge and educational skills. 8. Building development and government social affairs, and, and, and society in all different institutions.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Clarify the basic concepts. 2. Acquisition of skills in dealing with engineering problems and issues related to vibrations. 3. Acquiring basic skills as an introduction to understanding the principles of vibration. 4. Gain a basic understanding of how vibrations occur in various industrial applications. 5. Gain a basic understanding in vibration tools and instruments. 6. Gain a basic understanding in Vibration analysis programs.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. <u>Part A – Principles of vibration systems</u> <u>Single Degrees of Freedom:</u> Fundamentals of Vibrations. Importance of Study of Vibrations. Classification of vibration. Free Vibrations of Single Degree of Freedom. Vibration of undamped Torsional Systems. Vibrations of systems with Viscous Damping. [24 hrs.]. Forced vibration for undamped and damped system. Response of Damped system under harmonic motion of base. Response of Damped system under Rotating Unbalance. [16 hrs.].

	Multi-Degree of Vibration Systems. Derivation of Equation of Motion. Normal Mode Vibration. Coordinate Coupling. Eigenvalue and Eigenvector. Forced harmonic vibration. Influence coefficients. Lagrange's Equation [20 hrs.]. Part B – Vibration Applications Determination of Natural Frequency and Modal Shapes: Rayleigh's Method. Dunkerley's Formula. Holzer's Method [15 hrs.] Continuous Systems: Transverse Vibration of String. Longitudinal Vibrations of rod. Torsional Vibrations of Shafts and Rods. [15 hrs.] Vibration Control: Balancing of Rotating Machines. Whirling of rotating Shafts. Vibration Isolation. Control of Natural Frequencies. [15 hrs.]. Vibration Measurements: Vibration Pickups. Vibration Exciters. Signal Analysis [15 hrs.]. Review and discussion [8 hrs.]

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Type something like: The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials and by considering type of simple experiments involving some sampling activities that are interesting to the students.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	122	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	8
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	78	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	5.2
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	200		

Module Evaluation

تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	10% (10)	5, 10	LO #1, 2, 10 and 11
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Summative assessment	Midterm Exam	2 hr	10% (10)	7	LO # 1-7
	Final Exam	2 hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	Introduction - Fundamentals of Vibrations.
Week 2	Free Vibrations of undamped Single Degree of Freedom system.
Week 3	Vibrations of systems with Viscous Damping.
Week 4	Forced vibration for undamped and damped system.
Week 5	Response of Damped system under harmonic motion of base and Response of Damped system under Rotating Unbalance.
Week 6	Multi-Degree of freedom system Equation of Motion. Normal Mode Vibration Influence coefficients. Lagrange's Equation
Week 7	MDF Coordinate Coupling. Eigenvalue and Eigenvector. Forced harmonic vibration.
Week 8	Influence coefficients and Lagrange's Equation
Week 9	Determination of Natural Frequency and Modal Shapes: Rayleigh's Method
Week 10	Determination of Natural Frequency and Modal Shapes: Dunkerley’s Formula. Holzer's Method
Week 11	Continuous Systems: Transverse Vibration of String.
Week 12	Continuous Systems: Longitudinal Vibrations of rod. Torsional Vibrations of Shafts and Rods
Week 13	Vibration Measurements: Vibration Pickups. Vibration Exciters. Review and discussion
Week 14	Vibration Measurements: Balancing of Rotating Machines.
Week 15	Vibration Measurements: Signal Analysis
Week 16	**Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: Single Degree of Freedom system (simple pendulum)
Week 2	Lab 2: Single Degree of Freedom system (mass spring system)
Week 3	Lab 3: : Torsional vibration system
Week 4	Lab 4: Torsional vibration system with damping
Week 5	Lab 5: Two degree of freedom system
Week 6	Lab 6: Forced vibration
Week 7	Lab 7: whirling of shafts.

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Theory of Vibration with Application, William T. Thomson.	Yes
Recommended Texts	Mechanics of Machines Elementary Theory and Examples, J. H. Hannah and R. C. Stephens.	yes
Websites	https://power-mi.com/content/vibration-analysis-learning	

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Student Learning Outcomes **2023 - 2024** **مخرجات التعلم للطلبة**

University of Basrah
College of Engineering

جامعة البصرة
كلية الهندسة

First Cycle-Bachelor′s Degree (B.Sc.)\ Mechanical Engineering بكالوريوس هندسة ميكانيكية

Student Learning Outcomes

These student learning outcomes in Mechanical Engineering ensure that graduates are well-prepared to contribute to the design, development, and operation of mechanical systems in diverse industries such as automotive, aerospace, energy, manufacturing, and robotics.

1. Technical Competence: Mechanical Engineering students will develop a strong foundation in core engineering principles and acquire technical expertise in areas such as thermodynamics, mechanics, materials science, and control systems. They will demonstrate proficiency in applying this knowledge to solve complex engineering problems.
2. Design and Innovation: Students will gain the skills to design and innovate mechanical systems and components. They will be able to analyze requirements, develop conceptual designs, and apply engineering principles to create efficient, reliable, and sustainable solutions.
3. Experimental and Analytical Skills: Mechanical Engineering students will develop the ability to conduct experiments, analyze data, and draw meaningful conclusions. They will utilize laboratory equipment and computational tools to evaluate the performance of mechanical systems and validate design solutions.
4. Teamwork and Communication: Students will work effectively in multidisciplinary teams, demonstrating collaboration, leadership, and effective communication skills. They will be able to contribute constructively to group projects, present technical information clearly, and collaborate with professionals from diverse backgrounds.
5. Professional Ethics and Responsibility: Mechanical Engineering graduates will understand the ethical and professional responsibilities associated with their profession. They will adhere to high standards of integrity, demonstrate awareness of environmental and societal impacts, and prioritize safety and sustainability in their engineering practices.

6. Lifelong Learning and Adaptability: Students will develop a mindset of continuous learning and adaptability to evolving technologies and industry trends. They will engage in professional development activities, stay updated with advancements in the field, and possess the skills to adapt to new challenges and technologies throughout their careers.