University of Babylon
Faculty of Engineering – Al-Musayab
Energy Engineering Department

First Cycle - Bachelor's degree (B.Sc.) – Energy Engineering

بكالوريوس علوم – هندسة الطاقة والطاقات المتجددة

عمادة كلية الهندسة

مصادقة السيد عميد الكلية

أ.م.د. وسام جليل مصير

مصادقة رئيس قسم الطاقة

د. ماهر جابر عبد الحميد

م / محضر لجنة اعداد دليل مسار بولونيا

تحية طيبة ...

اجتمعت اللجنة المشكلة بموجب الامر الاداري ذي العدد ( ) في / 5 / 2023 الخاصة بتشكيل لجنة اعداد دليل مسار بولونا في قسم هندسة الطاقة وكالاتي :

- الملحق (1) البرنامج الدراسي .
- الملحق (2) المنهاج الدراسي .
- الملحق (3) المواد الدراسية .
- الملحق (4) وصف المواد الدراسية .

واتمت اللجنة أعداد الدليل ، وحسب الملفات المرفقة .

للتفضل بالاطلاع والمصادقة ... وبهذا ختم المحضر ... مع الاحترام

أ.م.د. علي صبري علو عضو اللجنة / 6 / 2023	م.د. اوس اكرم محمود عضو اللجنة / 6 / 2023	م. د. علي جابر عبدالحميد عضو اللجنة / 6 / 2023

أ.م.د. سناء عبدالرزاق جاسم عضو اللجنة / 6 / 2023	أ . م . ميثم حسين رشيد رئيس لجنة أعداد دليل مسار بولونيا

University of Babylon | ملحق رقم (1) | جامعة بابل

Faculty of Engineering - Almusayab | كلية الهندسة - المسيب

Bachelor's degree in Energy Engineering (First cycle) | بكالوريوس في هندسة الطاقة (الدورة الأولى)

Four years (Eight semesters) - 240 ECTS credits - 1 ECTS = 25 hr | أربع سنوات (ثمانية فصول دراسية) - ٢٤٠ وحدة اوربية - كل وحدة اوربية = ٢٥ ساعة

Program Curriculum (2023 - 2024) | المنهاج الدراسي للعام ٢٠٢٣-٢٠٢٤

Level	Semester	No.	Module Code	Module Name in English	اسم المادة الدراسية	Language	SSWL (hr/w) CL (hr/w)	Lect (hr/w)	Lab (hr/w)	Pr (hr/w)	Tut (hr/w)	Semn (hr/w)	Exam hr/sem	SSWL hr/sem	USSWL hr/sem	SWL hr/sem	ECTS	Module Type	Prerequisite Module(s) Code
UGI	One	1	UOBAB0301011	Engineering Drawing and Auto-CAD I	الرسم الهندسي والاوتوكاد I	English	1		2	3			5	95	55	150	6	S	
		2	UOBAB0301012	Electrical Circuits	الدوائر الكهربائية	English	3		2		1		4	94	56	150	6	S	
		3	UOBAB0301013	Mathematics I	رياضيات I	English	3				1		4	64	86	150	6	S	
		4	UOBAB0301014	Physics	الفيزياء	English	2		2				4	64	61	125	5	S	
		5	UOBAB0301015	Fundamental of Computer	اساسيات الحاسوب	English	1		2				4	49	51	100	4	B	
		6	UOBAB0301016	Arabic language	اللغة العربية	Arabic	2						3	33	42	75	3	B	
						Total	12	0	8	3	2	0	24	399	351	750	30		

Level	Semester	No.	Module Code	Module Name in English	اسم المادة الدراسية	Language	SSWL (hr/w) CL (hr/w)	Lect (hr/w)	Lab (hr/w)	Pr (hr/w)	Tut (hr/w)	Semn (hr/w)	Exam hr/sem	SSWL hr/sem	USSWL hr/sem	SWL hr/sem	ECTS	Module Type	Prerequisite Module(s) Code
	Two	1	UOBAB0301021	Engineering Drawing and Auto-CAD II	الرسم الهندسي والاوتوكاد II	English	1		2	3			5	95	55	150	6	S	
		2	UOBAB0301022	Engineering Mechanics	الميكانيك الهندسي	English	3				1		4	64	86	150	6	S	
		3	UOBAB0301023	Mathematics II	رياضيات I	English	3				1		4	64	86	150	6	S	
		4	UOBAB0301024	Manufacturing Processes & Engineering Workshop	عمليات التصنيع والورش الهندسية	English	2			2			4	64	36	100	4	S	
		5	UOBAB0301025	Chemistry	الكيمياء	English	2		2				4	64	36	100	4	S	
		6	UOBAB0301026	English Language I	اللغة الانكليزية I	English	3						3	48	52	100	4	B	
						Total	14	0	4	5	2	0	24	399	351	750	30		

Level	Semester	No.	Module Code	Module Name in English	اسم المادة الدراسية	Language	SSWL (hr/w) CL (hr/w)	Lect (hr/w)	Lab (hr/w)	Pr (hr/w)	Tut (hr/w)	Semn (hr/w)	Exam hr/sem	SSWL hr/sem	USSWL hr/sem	SWL hr/sem	ECTS	Module Type	Prerequisite Module(s) Code
UGII	Three	1	UOBAB0301031	Thermodynamics I	ديناميك الحرارة I	English	2		2		1		4	79	71	150	6	S	
		2	UOBAB0301032	Fluid Mechanics I	ميكانيك الموائع I	English	2		2		1		4	79	71	150	6	S	
		3	UOBAB0301033	Engineering Mathematics	الرياضيات الهندسية	English	3				1		4	64	86	150	6	S	
		4	UOBAB0301034	Electronic Circuits	الدوائر الالكترونية	English	2		2		1		4	79	21	100	4	S	
		5	UOBAB0301035	English Language II	اللغة الانكليزية II	English	3						3	48	52	100	4	B	
		6	UOBAB0301036	Material Science	علم المواد	English	2				1		4	49	51	100	4	S	
						Total	14	0	6	0	5	0	23	398	352	750	30		

Level	Semester	No.	Module Code	Module Name in English	اسم المادة الدراسية	Language	SSWL (hr/w) CL (hr/w)	Lect (hr/w)	Lab (hr/w)	Pr (hr/w)	Tut (hr/w)	Semn (hr/w)	Exam hr/sem	SSWL hr/sem	USSWL hr/sem	SWL hr/sem	ECTS	Module Type	Prerequisite Module(s) Code
	Four	1	UOBAB0301041	Thermodynamics II	ديناميك الحرارة II	English	2		2		1		4	79	71	150	6	S	
		2	UOBAB0301042	Fluid Mechanics II	ميكانيك الموائع II	English	2		2		1		4	79	71	150	6	S	
		3	UOBAB0301043	Strength of Materials	مقاومة المواد	English	2		2		1		4	79	71	150	6	S	
		4	UOBAB0301044	Principles of Energy Engineering	مبادىء هندسة الطاقة	English	3				1		4	64	86	150	6	C	
		5	UOBAB0301045	Computer Programming (Matlab)	برمجة الحاسوب (الماتلاب)	English	1		2				4	49	51	100	4	E	
		6	UOBAB0301046	Human Rights and democracy	حقوق الانسان والديمقراطية	Arabic	2						3	33	17	50	2	B	
						Total	12	0	8	0	4	0	23	383	367	750	30		

Level	Semester	No.	Module Code	Module Name in English	اسم المادة الدراسية	Language	SSWL (hr/w)						Exam hr/sem	SSWL hr/sem	USSWL hr/sem	SWL hr/sem	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)							
UGIII	Five	1	UOBAB0301051	Engineering Analysis	التحليل الهندسي	English	3				1		4	64	86	150	6	S	
		2	UOBAB0301052	Electrical machines	المكائن الكهربائية	English	2		2				4	64	61	125	5	S	
		3	UOBAB0301053	Heat transfer - conduction	انتقال الحرارة - التوصيل	English	2		2		1		4	79	46	125	5	S	
		4	UOBAB0301054	Mechanical Element Design & CAD	تصميم الاجزاء الميكانيكية والكاد	English	2			2	1		4	79	46	125	5	S	
		5	UOBAB0301055	Hydrogen energy and Fuel Cells	طاقة الهيدروجين وخلايا الوقود	English	2		2		1		4	79	46	125	5	C	
		6	UOBAB0301056	Fossil Fuels	الوقود الاحفوري	English	2						4	34	66	100	4	C	
						Total	13	0	6	2	4	0	24	399	351	750	30		

Level	Semester	No.	Module Code	Module Name in English	اسم المادة الدراسية	Language	SSWL (hr/w)						Exam hr/sem	SSWL hr/sem	USSWL hr/sem	SWL hr/sem	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)							
	Six	1	UOBAB0301061	Numerical analysis	التحليل العددي	English	2			2			4	64	86	150	6	S	
		2	UOBAB0301062	Waste management and bio-energy	ادارة المخلفات وطاقة الكتل الحيوية	English	2		2				4	64	61	125	5	C	
		3	UOBAB0301063	Heat Transfer - convection & radiation	انتقال الحرارة - الحمل والاشعاع	English	2		2		1		4	79	46	125	5	S	
		4	UOBAB0301064	Mechanical System Design &CAE	تصميم الانظمة الميكانيكية والكاي	English	2			2			4	64	61	125	5	S	
		5	UOBAB0301065	Electrical Power Systems	انظمة القدرة الكهربائية	English	3						4	49	51	100	4	S	
		6	UOBAB0301066	Combustion Energy	طاقة الاحتراق	English	2		2		1		4	79	46	125	5	S	
						Total	13	0	6	4	2	0	24	399	351	750	30		

Level	Semester	No.	Module Code	Module Name in English	اسم المادة الدراسية	Language	SSWL (hr/w)						Exam hr/sem	SSWL hr/sem	USSWL hr/sem	SWL hr/sem	ECTS	Module Type	Prerequisite Module(s) Code
							CL (hr/w)	Lect (hr/w	Lab (hr/w)	Pr (hr/w)	Tut (hr/w	Semn							
UGIV	Seven	1	UOBAB0301071	Control & Measurement in Energy Systems	السيطرة والقياسات في انظمة الطاقة	English	3		2		1		4	94	56	150	6	C	
		2	UOBAB0301072	Solar & Wind Energy	الطاقة الشمسية وطاقة الرياح	English	3		2		1		4	94	56	150	6	C	
		3	UOBAB0301073	Turbomachinery	المكائن التوربينية	English	3				1		4	64	86	150	6	S	
		4	UOBAB0301074	Energy management & economics	ادارة واقتصاد الطاقة	English	3				1		4	64	61	125	5	C	
		5	UOBAB0301075	Energy and Environment	الطاقة والبيئة	English	2						4	34	66	100	4	C	
		6	UOBAB0301076	Graduation Project I	المشروع الهندسي	English	1			2			4	49	26	75	3	C	
						Total	15	0	4	2	4	0	24	399	351	750	30		

Level	Semester	No.	Module Code	Module Name in English	اسم المادة الدراسية	Language	SSWL (hr/w)						Exam hr/sem	SSWL hr/sem	USSWL hr/sem	SWL hr/sem	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)							
	Eight	1	UOBAB0301081	Power Plants	محطات القدرة	English	3		2		1		4	94	56	150	6	C	
		2	UOBAB0301082	Energy Storage Systems	انظمة خزن الطاقة	English	2		2		1		4	79	71	150	6	C	
		3	UOBAB0301083	Design of energy systems by computer	تصميم انظمة الطاقة بالحاسوب	English	2			3			4	79	71	150	6	C	
		4	UOBAB0301084	Nuclear energy	الطاقة النووية	English	2				1		4	49	76	125	5	C	
		5	UOBAB0301085	Engineering professional Ethics	اخلاقيات المهن الهندسية	English	2						4	34	66	100	4	E	
		6	UOBAB0301086	Graduation Project II	المشروع الهندسي II	English	1			2			4	49	26	75	3	C	
						Total	12	0	4	5	3	0	24	384	366	750	30		

						Total	105	0	46	21	26	0	190	3160	2840	6000	240		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			Module type										
	CL	Class Lecture		B	Basic learning activities		SWL:	Student Workload					
	Lab	Laboratory		C	Core learning activity		SSWL:	Structured SWL					
	Pr	Practical Training		S	Suport or related learning activity		USSWL:	Unstructured SWL					
	Tut	Tutorial		E	Elective learning activity								
	Lect	Online lecture											
	Semn	Seminar	Note: Columns O, P and Q are progrmaed, protected and should not be edited										

Appendix (2)
Program Catalogue

الملحق (٢)
دليل البرنامج الدراسي

First Cycle - Bachelor's degree (B.Sc.) – Energy Engineering

بكالوريوس علوم – هندسة الطاقة والطاقات المتجددة

مصادقة رئيس قسم الطاقة

مصادقة السيد عميد الكلية

Table of Contents جدول المحتويات		
1	Mission & Vision & Statement	بيان المهمة والرؤية
2	Program specification	مواصفات البرنامج
3	Program Goal	اهداف البرنامج
4	Student learning outcome	مخرجات تعلم الطالب
5	Academic Staff	الهيئة التدريسية
6	Credit, Grading and GPA	الاعتمادات والدرجات والمعدل التراكمي
7	Modules	المواد الدراسية
8	Contact	الاتصال

1) Vision & Mission Statement

Vision Statement:

Our goal is to establish leadership in engineering education and applied research within the field of energy engineering, both locally and globally. We aim to achieve this by providing community services, fostering cooperation, and building exchange relationships with various local and international universities. Our focus is on equipping engineering professionals with specialized knowledge in the design, implementation, operation, and maintenance of power generation stations. Through the acquisition of engineering skills and the excellence of our graduates, we aim to make a significant impact in the energy engineering sector, both locally and globally.

Mission Statement:

We strive to foster leadership in creativity, innovation, and continuous improvement in scientific research. Our aim is to contribute to the prosperity of society by preparing applied engineers specializing in the field of energy and environmentally friendly alternatives. We aspire to develop professional leaders and efficient scientific researchers who possess a high level of knowledge and technological creativity. Our ultimate goal is to achieve quality assurance and academic accreditation, adhering to globally recognized standards in engineering and scientific curricula, while maintaining a strong commitment to engineering ethics.

2) Program Specification

Programmer	BSc– Energy Engineering	ECTS	240
Duration	4 levels – 8 Semesters	Method of Attendance	Full times

Energy Engineering Department was established in the University of Babylon College of Engineering / Al-mussaib during the year 2014. The program specializes in graduation of applied engineers after four years of study in the jurisdiction of Energy and Renewable Energies Engineering where graduated students have familiarity and knowledge in related electrical and mechanical and chemical engineering

at the same time. The Bachelor of Engineering is a professional degree that allows graduates of the program to register in the Iraqi Engineers Association and practice the profession directly after graduation. The four-year program included one and two years' study common to the major, covering basic science and engineering topics courses besides the general education topics, and then last 2 years of specialization in Energy and Renewable Energies Engineering. The curriculum was also developed to satisfy the Iraqi requirements for licensure. The program prepares students for different types of conventional energy and renewable energies like solar, wind, bio and other kinds of renewable energies with energy efficiency course.

3) Program Goals:

a) Enter the energy and renewable energies engineering profession as practicing engineers and consultants with prominent companies and organizations in diverse areas that related to energy and renewable energies engineering.
b) Pursue graduate education and research at major research universities in Energy and Renewable Energies engineering, and related fields.
c) Advance in their chosen fields to supervisory and management positions
d) Engage in continued learning through professional development.
e) Participate in and contribute to professional societies and community services.

4) Student learning outcomes:

(a) An ability to identify, formulates, and solves engineering in energy and renewable energies engineering problems by applying principles of engineering, science, and mathematics.
(b) An ability to apply the engineering design process to produce solutions that meet specified needs with consideration for public health and safety, and global, cultural, social, environmental, economic, and other factors as appropriate to the discipline.
(c) An ability to develop and conduct appropriate experimentation analyzes and interprets data, and use engineering judgment to draw conclusions.
(d) An ability to communicate effectively with a range of audiences.
(e) An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.
(f) An ability to recognize the ongoing need to acquire new knowledge, to choose appropriate learning strategies, and to apply this knowledge.
(g) An ability to function effectively as a member or leader of a team that establishes goals, plans tasks, meets deadlines, and creates a collaborative and inclusive environment.

5) Academic Staff

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6) Credits, Grading and GPA

Credits:

University of Babylon – College of Engineering / Al-mussaib , Energy Engineering Department is following the Bologna Process with the European Credit Transfer System (ECTS) credit system. The total degree program number of ECTS is 240 , 30 ECTS per semester. One ECTS is equivalent to (25 hr.) 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: 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.

Calculation of the Cumulative Grade Point Average (CGPA):

1. The CGPA is calculated by the summation of each module score multiplied by its ECTS, all are divided by the program total ECTS.
2. CGPA of a 4-year B.Sc. degrees is

[CGPA = (1^{st} module score x ECTS) + (2^{nd} module score x ECTS) + (3^{rd} module score x ECTS) + (4^{th} module score x ECTS) / 240]

7) Curriculum / Modules

Semester 1 = 30 ECTS / 1 ECTS = 25 hr.

No.	Module Code	Module Name in English	SSWL hr/sem	USSWL hr/sem	ECTS	Module Type	Prerequisite Module(s) Code
1	UOBAB0301011	Engineering Drawing and Auto-CAD I	95	55	6	S	
2	UOBAB0301012	Electrical Circuits	94	56	6	S	
3	UOBAB0301013	Mathematics I	64	86	6	S	
4	UOBAB0301014	Physics	64	61	5	S	
5	UOBAB0301015	Fundamental of Computer	49	51	4	B	
6	UOBAB0301016	Arabic language	33	42	3	B	

Semester 2 = 30 ECTS / 1 ECTS = 25 hr.

No.	Module Code	Module Name in English	SSWL hr/sem	USSWL hr/sem	ECTS	Module Type	Prerequisite Module(s) Code
1	UOBAB0301021	Engineering Drawing and Auto-CAD II	95	55	6	S	UOBAB0301011
2	UOBAB0301022	Engineering Mechanics	64	86	6	S	
3	UOBAB0301023	Mathematics II	64	86	6	S	UOBAB0301013
4	UOBAB0301024	Manufacturing Processes & Engineering Workshop	64	36	4	S	
5	UOBAB0301025	Chemistry	64	36	4	S	
6	UOBAB0301026	English Language I	48	52	4	B	

Semester 3 = 30 ECTS / 1 ECTS = 25 hr.

No.	Module Code	Module Name in English	SSWL hr/sem	USSWL hr/sem	ECTS	Module Type	Prerequisite Module(s) Code
1	UOBAB0301031	Thermodynamics I	79	71	6	S	
2	UOBAB0301032	Fluid Mechanics I	79	71	6	S	
3	UOBAB0301033	Engineering Mathematics	64	86	6	S	
4	UOBAB0301034	Electronic Circuits	79	21	4	S	
5	UOBAB0301035	English Language II	48	52	4	B	
6	UOBAB0301036	Material Science	49	51	4	S	

Semester 4 = 30 ECTS / 1 ECTS = 25 hr.

No.	Module Code	Module Name in English	SSWL hr/sem	USSWL hr/sem	ECTS	Module Type	Prerequisite Module(s) Code
1	UOBAB0301041	Thermodynamics II	79	71	6	S	UOBAB0301031
2	UOBAB0301042	Fluid Mechanics II	79	71	6	S	UOBAB0301032
3	UOBAB0301043	Strength of Materials	79	71	6	S	UOBAB0301036
4	UOBAB0301044	Principles of Energy Engineering	64	86	6	C	
5	UOBAB0301045	Computer Programming (MATLAB)	49	51	4	E	
6	UOBAB0301046	Human Rights and democracy	33	17	2	B	

Semester 5 = 30 ECTS / 1 ECTS = 25 hr.

No.	Module Code	Module Name in English	SSWL hr/sem	USSWL hr/sem	ECTS	Module Type	Prerequisite Code
1	UOBAB0301051	Engineering Analysis	64	86	6	S	
2	UOBAB0301052	Electrical machines	64	61	5	S	
3	UOBAB0301053	Heat transfer - conduction	79	46	5	S	
4	UOBAB0301054	Mechanical Element Design & CAD	79	46	5	S	
5	UOBAB0301055	Hydrogen energy and Fuel Cells	79	46	5	C	
6	UOBAB0301056	Fossil Fuels	34	66	4	C	

Semester 6 = 30 ECTS / 1 ECTS = 25 hr.

No.	Module Code	Module Name in English	SSWL hr/sem	USSWL hr/sem	ECTS	Module Type	Prerequisite Code
1	UOBAB0301061	Numerical analysis	64	86	6	S	
2	UOBAB0301062	Waste management and bio-energy	64	61	5	C	
3	UOBAB0301063	Heat Transfer - convection & radiation	79	46	5	S	UOBAB0301031
4	UOBAB0301064	Mechanical System Design &CAE	64	61	5	S	UOBAB0301054
5	UOBAB0301065	Electrical Power Systems	49	51	4	S	
6	UOBAB0301066	Combustion Energy	79	46	5	S	UOBAB0301056

Semester 7 = 30 ECTS / 1 ECTS = 25 hr.

No.	Module Code	Module Name in English	SSWL hr/sem	USSWL hr/sem	ECTS	Module Type	Prerequisite Code
1	UOBAB0301071	Control & Measurement in Energy Systems	94	56	6	C	
2	UOBAB0301072	Solar & Wind Energy	94	56	6	C	
3	UOBAB0301073	Turbomachinery	64	86	6	S	
4	UOBAB0301074	Energy management & economics	64	61	5	C	
5	UOBAB0301075	Energy and Environment	34	66	4	C	
6	UOBAB0301076	Graduation Project I	49	26	3	C	

Semester 8 = 30 ECTS / 1 ECTS = 25 hr

No.	Module Code	Module Name in English	SSWL hr/sem	USSWL hr/sem	ECTS	Module Type	Prerequisite Code
1	UOBAB0301081	Power Plants	94	56	6	C	UOBAB0301073
2	UOBAB0301082	Energy Storage Systems	79	71	6	C	
3	UOBAB0301083	Design of energy systems by computer	79	71	6	C	
4	UOBAB0301084	Nuclear energy	49	76	5	C	
5	UOBAB0301085	Engineering professional Ethics	34	66	4	E	
6	UOBAB0301086	Graduation Project II	49	26	3	C	UOBAB0301076

8) Contact:

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Appendix (٣)
Course Catalogue

الملحق (٣)
دليل المواد الدراسية

Bachelor of Science Honors (B.Sc. Honors) – Energy Engineering
بكالوريوس علوم - هندسة الطاقة

Table of Contents

1. Overview

This catalogue is about the courses (modules) given by the program of Energy Engineering to gain the Bachelor of Science degree. The program delivers (48) 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 هندسة الطاقة. يقدم البرنامج (48) مادة دراسية مع (٦٠٠٠) إجمالي ساعات حمل الطالب و ٢٤٠إجمالي وحدات أوروبية. يعتمد تقديم المواد الدراسية على عملية بولونيا.

1. Undergraduate Courses 2023-2024

First level

Code	Course/Module Title	ECTS	Semester
UOBAB03010101 & UOBAB03010201	Engineering Drawing and Auto-CAD I & Engineering Drawing and Auto-CAD II	12	2
Class (hr/w)	**Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
1	2/3/1	95	55
Description			
An engineering drawing course focuses on usage of drawing instruments, lettering, construction of geometric shapes, etc. Students study use of dimensioning, shapes and angles or views of such drawings. Dimensions feature prominently, with focus on interpretation, importance, and accurate reflection of dimensions in engineering drawing. Other areas of study in this course may include projected views and development of surface. In Assembly drawing the student will be able to assemble mechanical parts together from its main projected view. All the topics will be applied in AutoCAD simultaneously.			

Code	Course/Module Title	ECTS	Semester
UOBAB0301012	Electrical Circuits	6	1
Class (hr/w)	**Lab./Prac./Tutor.**	**SSWL (hr/sem)**	**USSWL (hr/w)**
3	2/0/1	93	57
Description			
It is an essential course for energy engineering students. This course consists of the following: Series and Parallel dc Circuits. Analysis Techniques (dc). Networks Theorems (dc). Capacitors, Sinusoidal Alternating Quantities. Series and Parallel ac Circuit, Analysis Techniques (ac), Network Theorems (ac), Electric Power in dc and ac Circuits, Resonance in ac Circuits.			

Code	Course/Module Title	ECTS	Semester
UOBAB0301013 & UOBAB0301022	Mathematics I & Mathematics I	10	2
Class (hr/w)	**Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
3	0/0/1	64	61
Description			
This course the student the following topics: Complex Numbers and Variables, Functions and their graphs, Limits and Continuity, Derivatives, Chain Rule and Applications, Integration: definite and indefinite, Integration by parts and applications: area and volumes of solids, transcendental and inverse trigonometric functions, techniques of integration: substitution and partial fractions. In Math II, Hyperbolic functions, vectors: dot and cross products, Derivatives of vector valued function. Multiple integrals and applications, Differential equations: separable 1^{st} order equations, Homogeneous: 1^{st} and 2^{nd} order Differential equations will be covered.			

Code	Course/Module Title	ECTS	Semester
UOBAB0301014	Physics	5	1
Class (hr/w)	**Lab./Prac./Tutor.**	**SSWL (hr/sem)**	**USSWL (hr/w)**
2	2/0/0	64	61
Description			
This course will cover the Matter-Energy relationship, properties of matter, state of matter, structure of elements, basic forces in nature, energy sources, thermal energy, radiant energy, black-body radiation, electromagnetic spectrum, Boher theory of the H-atom, basics of the quantum theory of the atom, atomic nucleus, binding energy, radioactivity, nuclear reactions, fission, fusion, chain reactions, basic elements of the solid-state physics, bonding and energy bands in solids, electrical conductivity, conductors, semiconductors, insulator, PN-junction, majority and minority carriers, photoconductors, photo-sensors, solar cells.			

Code	Course/Module Title	ECTS	Semester
UOBAB0301015	Fundamentals of Computer	4	1
Class (hr/w)	**Lab./Prac./Tutor.**	**SSWL (hr/sem)**	**USSWL (hr/w)**
1	2/0/0	49	51
Description			
An introduction to fundamental concepts of computers, construction of digital computer system hardware and software. Machine language concepts and internal data representations, integer, real and character data types. Algorithms and flowcharts as tools of program design process. Basic program structure: sequencing, alteration and iteration methods. Parts of a PC, motherboard, memory, graphics card, sound card, memory, hard disk, floppy disk, network card.			

Code	Course/Module Title	ECTS	Semester
UOBAB03010164	Arabic Language	3	1
Class (hr/w)	**Lab./Prac./Tutor.**	**SSWL (hr/sem)**	**USSWL (hr/w)**
2	0/0/0	33	42
Description			

Code	Course/Module Title	ECTS	Semester
UOBAB0301022	Engineering Mechanics	6	1
Class (hr/w)	**Lab./Prac./Tutor.**	**SSWL (hr/sem)**	**USSWL (hr/w)**
3	0/0/1	64	86
Description			
This course will cover static and dynamic mechanics. This will involve the following topics: in static; Introduction and Basic Concept, Vectors, Resolution of a forces in two and three dimensions, Resultant of a force system in two and three dimensions, Moments & Couples in two and three dimensions, Equilibrium in two and three dimensions, Analysis of trusses and frames, Friction and applications, Center of area and gravity, Moments of Inertia (Areas), Moments of Inertia (mass), Virtual work. Furthermore, in dynamics: Fundamentals of engineering dynamics covering kinematics of particles and rigid bodies. Thorough study of kinetics of particles and rigid bodies using Newton's laws of motion, work-energy methods, and impulse and momentum methods.			

Code	Course/Module Title	ECTS	Semester
UOBAB0301024	Manufacturing Process and Eng. Workshops	4	1
Class (hr/w)	**Lab./Prac./Tutor.**	**SSWL (hr/sem)**	**USSWL (hr/w)**
2	0/2/0	64	36
Description			
In this course the student will be trained to use of carpenter's tools, Exercise in preparing simple joints, Bench fitting practice, Exercise in marking and fittings, Use of measuring instruments. Smith's forge; Exercise in bending, upsetting and swaging. Familiarizing the students with the following processes: Soldering and brazing, Welding, Heat treatment, Molding and casting. Simple machine shop processes, such as turning, shaping, milling and sheet metal work.			

Code	Course/Module Title	ECTS	Semester
UOBAB0301025	Chemistry	4	1
Class (hr/w)	**Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	2/0/0	64	36
Description			
This course covers an introduction to the four disciplines of modern chemistry: analytical, inorganic, organic, and physical. Furthermore, this course will focus on the first three disciplines of chemistry, while the fourth one (physical chemistry) will be covered in a separate class. Gases: the equation of state for ideal and real gases. First law of thermodynamics: basic of heat, work, and energy and thermochemistry. Second law of thermodynamics-entropy. Third law of thermodynamics, Gibbs and Helmholtz energies, Chemical Equilibrium, Phase Equilibrium, Electrochemistry, and Chemical Kinetics.			

Code	Course/Module Title	ECTS	Semester
UOBAB0301026	English language I	4	1
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
3	0	48	52
Description			
This course is carefully tailored for students of Energy engineering studies to provide them with powerful language tools for their future professions. The course will be dealing with all relevant topics related to terminology, communication, and common workplace situations, with practical grammar and vocabulary exercises including quizzes and role-plays. It will focus on how to incorporate terms from their fields of expertise into language skills and functions.			

Second Level

Code	Course/Module Title	ECTS	Semester
UOBAB0301031 & UOBAB0301041	Thermodynamics I & II	6	2
Class (hr/w)	**Lab./Prac./Tutor.**	**SSWL (hr/sem)**	**USSWL (hr/w)**
2	2/0/1	79	71
Description			
Thermodynamics I present the pure substance and their different with Ideal gas, then provide the relationship between work & heat by applying the 1st law of thermodynamics in open and close system. Thermodynamics assists student to understand and ability of use substance in systems, especially students will be works in power plant station. Thermodynamics II presents heat engines and refrigerator system, as well as present the entropy and 2nd law of thermodynamics. Thermodynamics II presents the efficiency in turbine, compressor, and nozzles; therefore, thermodynamics II assist the student to understand and gain ability to deal with thermal and refrigerant engines as well as power plant stations.			

Code	Course/Module Title	ECTS	Semester
UOBAB0301032 & UOBAB0301042	Fluid Mechanics I & II	6	2
Class (hr/w)	**Lab./Prac./Tutor.**	**SSWL (hr/sem)**	**USSWL (hr/w)**
2	2/0/1	79	71
Description			
General introduction to fluid mechanics; Fluid static and pressure Application; Forces on immersed bodies and surfaces; Accelerated fluid and relative motion; Equilibrium of floating bodies; Introduction to fluid motion; continuity equation; Equations of motions and their applications; Dimensional analysis and similarity; Motion of viscous fluids in conduits/ and definition of boundary layer; Friction losses in pipes; Measurements of fluid flow; Analysis of piping system.			

Code	Course/Module Title	ECTS	Semester
UOBAB0301033	Engineering Mathematics	6	1
Class (hr/w)	**Lab./Prac./Tutor.**	**SSWL (hr/sem)**	**USSWL (hr/w)**
3	0/0/1	64	86
Description			
After covering the Math in the first level the student will be taught more engineering related Mathematics in this course. Therefore, the following topic will be covered: Circles, parabola, ellipse, hyperbola, rotation, hyperbolic functions, inverse			

hyperbolic functions. Polar coordinate and parametric equations. Vector Analysis: Equations of lines and planes, product of three or more vectors, vector function and motion: velocity and acceleration, tangential vectors, curvature and normal vector. Fourier Series: Periodic functions, Fourier series, Euler formulas, even and odd functions (Half–Range expansions), applications in electrical engineering. Fourier Transform: Complex exponential form, Fourier Integral, Fourier transforms and inverse, Properties, convolution theorem, power spectral density and convolution signals and linear system applications. Sequences and Series: Sequences (convergence, test of monotone), series (geometric series, nth partial sum, test of convergence, alternating series), power and Taylor's series. Partial Differentiation: Function of two or more variables, partial derivatives, directional derivative, gradient, divergence, curl, tangent plane and normal line, maxima, minima, saddle point. Ordinary Differential Equations: First order (variables separable, homogeneous, linear – Bernoulli and exact, second order (homogeneous and non-homogeneous), higher order differential equations. Laplace Transform: Unit step function, Gamma function, definition of Laplace transform, properties, inverse of Laplace transform, properties, partial fractions, convolution theorem, integral equation, solution of differential equations using Laplace transform, applications.

Code	Course/Module Title	ECTS	Semester
UOBAB0301034	Electronic Circuits	4	1
Class (hr/w)	**Lab./Prac./Tutor.**	**SSWL (hr/sem)**	**USSWL (hr/w)**
2	2/0/1	79	21
Description			
This course will include the Diodes, clipping and clamping circuits, filters, types of transistors, equivalent circuits, analysis and applications, common base, common emitter and common collector models. Multistage amplifiers, FET and operation amplifier, Thyristor, Triac and Diac operation and applications. Moore over, the power electronics topic will also be covered such as : Converters in Equilibrium, Principles of Steady State Converter Analysis, Steady-State Equivalent Circuit Modeling, Losses, and Efficiency , Switch Realization, The Discontinuous Conduction Mode, Converter Circuits, Converter Dynamics and Control, AC Equivalent Circuit Modeling, Converter Transfer Functions, Controller Design, Magnetics, Basic Magnetics Theory, Inductor Design, Transformer Design, Layout and grounding principles.			

Code	Course/Module Title	ECTS	Semester
UOBAB0301035	English language II	4	1
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
3	0	48	52
Description			
This course is carefully tailored for students of Energy engineering studies to provide them with powerful language tools for their future professions. The course will be dealing with all relevant topics related to terminology, communication, and common workplace situations, with practical grammar and vocabulary exercises including quizzes and role-plays. It will focus on how to incorporate terms from their fields of expertise into language skills and functions.			

Code	Course/Module Title	ECTS	Semester
UOBAB0301036	Material Science	4	1
Class (hr/w)	**Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	0/0/1	49	51
Description			
This course will cover, the following topics: Introduction, classification of engineering materials, crystal structure, imperfections in crystals, structure of ingots chilled, thermal equilibrium diagrams, lever rule, applications on binary phase diagrams, mechanical properties of metals, application on mechanical testing and properties, iron and steel, carbon steel, cast iron, non-destructive inspection, heat treatment of steel, alloy steel, copper and its alloys, aluminum and its alloys, Nano-materials, plastics, ceramics and glass, and composite materials.			

Code	Course/Module Title	ECTS	Semester
UOBAB0301043	Strength of Materials	6	1
Class (hr/w)	**Lab./Prac./Tutor.**	**SSWL (hr/sem)**	**USSWL (hr/w)**
2	2/0/1	79	71
Description			
Simple stress- Normal stress, Shearing stress- Bearing stress, Thin – walled cylinders, Simple strain –Hooks; law, Axial deformation, Statically indeterminable members, Thermal stresses, Torsion- Torsion formulas, Flanged bolt couplings, Helical springs, Shear and moment in beams, Shear and bending moment diagrams, Stresses in beams- bending stresses, Unsymmetrical beams, Shearing stresses in beams, Built- up beams , Deflection and slope in beams , Double integration method , Moment- area method , Castigliunȯs theorem , Statically indeterminate beams , Three- moment equation , Combined stresses, Eccentrically loaded members , Mohr's circle for stresses, Application of Mohr's circle to combined loadings, Mohr's circle for strains , Columns, Euler's formula for long columns, Theories of failure Curved beam, strain energy.			

Code	Course/Module Title	ECTS	Semester
UOBAB0301044	Principles of Energy Engineering	6	1
Class (hr/w)	**Lab./Prac./Tutor.**	**SSWL (hr/sem)**	**USSWL (hr/w)**
3	0/0/1	64	86
Description			
Principles of energy engineering course will cover the basic engineering calculation and mathematical methodologies on material and energy balances and reaction rates during chemical transformations in energy systems. This is a required introductory course to the BS in energy engineering degree program. Students will be evaluated based on quizzes, homework, class participation, writing report, interactive tutorial and Mid-term and final exams.			

Code	Course/Module Title	ECTS	Semester
UOBAB0301045	Computer Programming (MATLAB)	4	1
Class (hr/w)	**Lab./Prac./Tutor.**	**SSWL (hr/sem)**	**USSWL (hr/w)**
1	0/2/0	49	51
Description			
This course teaches computer programming to those with little to no previous experience. It uses the programming system and language called MATLAB to do so because it is easy to learn, versatile and very useful for engineers and other professionals. MATLAB is a special-purpose language that is an excellent choice for writing moderate-size programs that solve problems involving the manipulation of numbers. The design of the language makes it possible to write a powerful program in a few lines. The problems may be relatively complex, while the MATLAB programs that solve them are relatively simple: relative, that is, to the equivalent program written in a general-purpose language, such as C++ or Java. As a result, MATLAB is being used in a wide variety of domains from the natural sciences, through all disciplines of engineering, to finance, and beyond, and it is heavily used in industry. Hence, a solid background in MATLAB is an indispensable skill in today's job market. Nevertheless, this course is not a MATLAB tutorial. It is an introductory programming course that uses MATLAB to illustrate general concepts in computer science and programming. Students who successfully complete this course will become familiar with general concepts in computer science, gain an understanding of the general concepts of programming, and obtain a solid foundation in the use of MATLAB. Students taking the course will get a MATLAB Online license free of charge for the duration of the course.			

Code	Course/Module Title	ECTS	Semester
UOBAB0301046	Human Rights and Democracy	2	1
Class (hr/w)	**Lab./Prac./Tutor.**	**SSWL (hr/sem)**	**USSWL (hr/w)**
2	0/0/0	33	17
Description			
According to the central curriculum.			

Third level

Code	Course/Module Title	ECTS	Semester
UOBAB0301051	Engineering Analysis	6	1
Class (hr/w)	**Lab./Prac./Tutor.**	**SSWL (hr/sem)**	**USSWL (hr/w)**
3	0/0/1	64	86
Description			
This course presents The Laplace Transformation and Applications, Fourier Series and Integrals , Euler relation, Odd and even functions, Half range Expansion, Complex Fourier, Fourier integration, Complex Numbers and Functions, Cauchy theorem ,			

Trigonometric function, Logarithmic function, Exponential function, Hyperbolic function Conformal Mapping, Gamma function, Beta function, Error function, Special Bessel functions and Legendre Polynomial, Vector and Tensor Analysis, Solution of Differential Equations by Power Series method, Partial Differential Equations, Equations forming, Separation of variables method, Solution of wave equations, Solution of Heat equations, Solution by Laplace transformation.

Code	Course/Module Title	ECTS	Semester
UOBAB0301052	Electrical machines	5	1
Class (hr/w)	**Lab./Prac./Tutor.**	**SSWL (hr/sem)**	**USSWL (hr/w)**
2	2/0/0	64	61
Description			
The course include the following topics: Generator, Emf equations, Types of D.C. generations and application, Internal and external characteristics, Motors, Types of D.C. motors and applications, Torque speed characteristics and equations , Starting of D.C. motors, Transformers, Poly-phase circuits, A.C. Machines. Types of A.C. machines, 3- phase synchronous and induction motors, Single phase A.C. motor, Convertors, Transmission and distribution.			

Code	Course/Module Title	ECTS	Semester
UOBAB0301053	Heat transfer - Conduction	5	1
Class (hr/w)	**Lab./Prac./Tutor.**	**SSWL (hr/sem)**	**USSWL (hr/w)**
2	2/0/1	79	46
Description			
This course will provide the students the main requirements to solve problem and design of the cases in solar system and Powe plants. Therefore, the following topics will be covered Introduction to conduction, convection, and radiation. Solutions to steady state and transient conduction problems. Heat conduction across contact surface, cylindrical walls and spherical walls. Heat generation in conduction. Numerical solution to applicable heat transfer cases. The course will be extended to include the transient heat transfer cases.			

Code	Course/Module Title	ECTS	Semester
UOBAB0301054	Mechanical Element Design & CAD	5	1
Class (hr/w)	**Lab./Prac./Tutor.**	**SSWL (hr/sem)**	**USSWL (hr/w)**
2	0/2/1	79	46
Description			
Introduction to machine design element; Review of stresses and strain; Factor of safety and design codes; Stress concentration; Static failure theories; Fatigue; Design of welded joints; Design of Screws and fasteners; Spring design; Shafts, keys and coupling; Bearing; Pressure Vessels; Flexible mechanical elements; Seals. General considerations and procedure of machine design, design			

stress, factor of safety, stress and deflection analysis, engineering materials and applications, fits and tolerances, design of fasteners and fastenings - pin, cotter, knuckle, screw, rivets, and welded joints. Design of shafts and couplings, common power and force transmitting power screws, belt drives and springs. A practical example will be solved using SOLIDWORKS. Therefore, this course the student will be taught SOLIDWORK starting from sketch, features and assembly includes doing motion function.

Code	Course/Module Title	ECTS	Semester
UOBAB0301055	Hydrogen energy and Fuel Cells	5	1
Class (hr/w)	**Lab./Prac./Tutor.**	**SSWL (hr/sem)**	**USSWL (hr/w)**
2	2/0/1	79	46
Description			
Electrochemical fuel cells represent the most efficient means for converting the chemical energy stored in a fuel to readily usable electrical energy. Fuel cells offer tremendous advantages in energy efficiency and reduced pollution in comparison to energy conversion by heat engines. This course introduces students to aspects of fuel cell engineering, with emphasis fuel cell systems, stacks, and single cells. Fuel cell concepts will be illustrated with quizzes, assignments, class participation, interactive tutorials, Mid-term and final exams, and laboratory reports.			

Code	Course/Module Title	ECTS	Semester
UOBAB0301056	Fossil Fuels	4	1
Class (hr/w)	**Lab./Prac./Tutor.**	**SSWL (hr/sem)**	**USSWL (hr/w)**
2	0/0/0	34	66
Description			
This course will cover the following topics: Introduction and definition of fuels, Types of fossils, Energy estimation of fossils and the related pollution consideration, API meaning and estimation, Oil products and properties, Oil refinery and production Gas and uses, Synthetic gases, Type of gas for consumption Processing of gas Transportation of gas, Petrochemical industry Global warming regarding fossils Pollution in oil industry, Transportation of oil.			

Code	Course/Module Title	ECTS	Semester
UOBAB0301061	Numerical Analysis	6	1
Class (hr/w)	**Lab./Prac./Tutor.**	**SSWL (hr/sem)**	**USSWL (hr/w)**
2	0/2/0	64	86
Description			
The Algebra of Matrices and System of Linear Algebraic Equations, Roots of Algebraic and Transcendental Equations, Differences and Interpolation, Characteristic Value Problems, Curves Fitting and Multiple Regression, Numerical Differentiations and Numerical Integrations, Simpson and double integration methods, Numerical Solution of Differential Equations by Finite Difference Method. The practical part will include the application of the examples by using computer employing MATLAB.			

Code	Course/Module Title	ECTS	Semester
UOBAB0301062	Waste management and bioenergy	5	1
Class (hr/w)	**Lab./Prac./Tutor.**	**SSWL (hr/sem)**	**USSWL (hr/w)**
2	2/0/0	64	61

Description

This course aims to provide the students with the knowledge on how to manage different types of waste and recover energy from them. The main focus due to the specialty of energy engineering main concentration will be on biowaste and its energy. Therefore, the following topics will be covered: Solid Waste-Characteristics and Perspectives: Definition - types – sources – generation and estimation. Properties: physical, chemical and biological – regulation. Collection, Transportation, and Processing Techniques: Onsite handling, storage and processing – types of waste collection mechanisms - transfer Stations: types and location – manual component separation – volume reduction: mechanical, thermal – separation: mechanical, magnetic electromechanical. Liquid Waste Management: Basics, types, working and typical conversion efficiencies of composting – anaerobic digestion – RDF – combustion – incineration – gasification – pyrolysis. Hazardous Waste Management: Hazardous waste – definition - potential sources - waste sources by industry – impacts – waste control methods – transportation regulations - risk assessment - remediation technologies – Private public partnership – Government initiatives. Ultimate Disposal: Landfill – classification – site selection parameters – design aspects – Leachate control – environmental monitoring system for Land Fill Gases.
In the bioenergy section the student will be taught Bio Energy Engineering. Introduction: Biomass: types – advantages and drawbacks – Indian scenario – characteristics – carbon neutrality – conversion mechanisms – fuel assessment studies. Bio-Methanation: Microbial systems – phases in biogas production – parameters affecting gas production – effect of additives on biogas yield – possible feed stocks. Biogas plants – types – design – constructional details and comparison – biogas appliances – Burner, illumination and power generation – effect on engine performance. Kinetics and mechanism- High-rate digesters for industrial wastewater treatment. Combustion: Perfect, complete, and incomplete – equivalence ratio – fixed Bed, fluid Bed – fuel and ash handling – steam cost comparison with conventional fuels. Briquetting: types of Briquetting – merits and demerits – feed requirements and pre-processing – advantages – drawbacks. Gasification: Types – comparison – application – performance evaluation – economics – dual fuel engines – 100 % Gas Engines – engine characteristics on gas mode – gas cooling and cleaning train. Pyrolysis and Carbonization: Pyrolysis - Types – process governing parameters – differential thermal analysis – differential scanning calorimetry – Typical yield rates. Effect of carbonization temperature on yield and composition of charcoal - Industrial safety in carbonization.

Code	Course/Module Title	ECTS	Semester
UOBAB0301063	Heat Transfer - convection & radiation	5	1
Class (hr/w)	**Lab./Prac./Tutor.**	**SSWL (hr/sem)**	**USSWL (hr/w)**
2	2/0/1	79	46

Description

Solutions to convection problems for laminar and turbulent flows. Forced and natural convection. Heat exchangers, heat exchanger effectiveness, and operational characteristics. Radiation heat transfer: basic principles, shape factor, and applications. Also, will be extended to cover the mass transfer.

Code	Course/Module Title	ECTS	Semester
UOBAB0301064	Mechanical System Design &CAE	5	1
Class (hr/w)	**Lab./Prac./Tutor.**	**SSWL (hr/sem)**	**USSWL (hr/w)**
2	0/2/0	64	61
Description			
Having the student gain the knowledge of the design of mechanical element in this course the following topic will be covered: Design of a powered machine using principles of systems engineering. Synthesis of machine frame, power transmission & controls. Risk & safety assessment. Model-based design using CAD. Basic design for manufacture & cost estimation. The student will be able to design the part of the wind turbine, steam, and gas turbine mechanical components. A simulation using SOLIDWORKS will be performed for several cases in this course.			

Code	Course/Module Title	ECTS	Semester
UOBAB0301065	Electrical Power Systems	4	1
Class (hr/w)	**Lab./Prac./Tutor.**	**SSWL (hr/sem)**	**USSWL (hr/w)**
3	0/0/0	49	51
Description			
fundamentals of energy-handling electric circuits, power electronic circuits such as inverters, and electromechanical apparatus. modeling of magnetic field devices and description of their behavior using appropriate models. simplification of problems using transformation techniques. analysis of power electric circuits, magnetic circuits, and elements of linear and rotating electric machinery. use of lumped parameter electro-mechanics to understand power systems. models of synchronous, induction, and DC machinery. the interconnection of electric power apparatus and operation of power systems.			

Code	Course/Module Title	ECTS	Semester
UOBAB0301066	Combustion Energy	5	1
Class (hr/w)	**Lab./Prac./Tutor.**	**SSWL (hr/sem)**	**USSWL (hr/w)**
2	2/0/1	79	46
Description			
Introduction, thermodynamics of combustion, chemical kinetics of combustion, flames, alternative fuels and energy systems, combustion appliances-gas, burner-functional requirement of burner-gas, burner classification, stoker firing, pulverized system of firing. Due to the application of the power generators the IC engine will be considered. Classification of IC engine components - Four stroke cycles, valve timing - Spark ignition - Air Fuel mixtures - Mixture requirements of power generation engines - Four stroke engine - Comparison of two strokes with four stroke engines - Engine power - Indicated power - Break horsepower - Engine efficiency - Performance analysis of IC engine - Heat balance - Solved problems - Cooling system of IC engines. This course will be extended to include the combustor in the gas turbine with its four main types and the working mechanism.			

Fourth level

Code	Course/Module Title	ECTS	Semester
UOBAB0301071	Control & Measurement in Energy Systems	6	1
Class (hr/w)	**Lab./Prac./Tutor.**	**SSWL (hr/sem)**	**USSWL (hr/w)**
3	2/0/1	94	56

Description

This course aims to provide the students with knowledge on how to use measurement equipment in the energy system and the control different type of energy system. Therefore, the topic that will be covered are Measurements Characteristics: Instrument classification - characteristics of instruments – static and dynamic - experimental error analysis - systematic and random errors - statistical analysis – uncertainty - experimental planning and selection of measuring instruments - reliability of instruments. Measurements of Physical Quantities: Measurement of thermo – physical properties, instruments for measuring temperature - pressure and flow. Advanced Measurements Techniques: Shadow graph – Schileren – Interferometer - Laser doppler anemometer - Hot wire anemometer, Heat flux sensors - Telemetry in measurement. Control Systems: Introduction - controllability, observability, Continuous and discrete process Controllers – Control Mode – Two – Step mode – Proportional Mode – Derivative Mode – Integral Mode – PID Controllers – Programmable Logic Controllers - Microprocessor PC based control applications. Data Acquisition and Processing: Multi-Channel Data acquisition system – Architecture of data acquisition and computer control system - Compact Data loggers – Sensor based, Computerized data systems - Micro – computer interfacing - Intelligent instruments in use.

Code	Course/Module Title	ECTS	Semester
UOBAB0301072	Solar & Wind Energy	6	1
Class (hr/w)	**Lab./Prac./Tutor.**	**SSWL (hr/sem)**	**USSWL (hr/w)**
3	2/0/1	94	56

Description

Solar energy presents solar radiation, solar time, and solar angles. These will assist the student to design the solar application systems such as a Flat Plat Collector, Parabolic Trough collector. Solar energy presents the design of PV array and how it produces voltage. In addition to, understand the phenomena of wind and know how to employee wind to produce the electric energy.

Code	Course/Module Title	ECTS	Semester
UOBAB0301073	Turbomachinery	6	1
Class (hr/w)	**Lab./Prac./Tutor.**	**SSWL (hr/sem)**	**USSWL (hr/w)**
3	0/0/1	64	86

Description

The objective of the course is to provide a framework to discuss different types of turbomachinery through a unified approach. The material presented is intended for undergraduate and graduate students apart from professional engineers in the energy

sectors engaged in the analysis of the work and development of turbomachinery. Coverage begins with the fundamental concepts, the equations of motion in a rotating system, and the Euler equation for turbomachinery. This is followed by the gas turbine cycle, similarity rules, and cascade flow analysis. The reader is then focused on flows through compressors and turbines, including a brief discussion on the secondary flow, tip clearance, blade cooling, surge, and stall. The course will be concluded with a discussion on CFD in the design and analysis of turbomachinery.

Code	Course/Module Title	ECTS	Semester
UOBAB0301074	Energy management & economics	5	1
Class (hr/w)	**Lab./Prac./Tutor.**	**SSWL (hr/sem)**	**USSWL (hr/w)**
3	0/0/1	64	61
Description			
Importance of energy management. Need of energy management and scope of energy management. The key economic concepts associated with the justification and evaluation of engineering projects and processes are introduced in this course. There are emphases on cost estimation, cash flow analysis, and profitability determination.			

Code	Course/Module Title	ECTS	Semester
UOBAB0301075	Energy and Environment	4	1
Class (hr/w)	**Lab./Prac./Tutor.**	**SSWL (hr/sem)**	**USSWL (hr/w)**
2	0/0/0	34	66
Description			
Environmental Pollution- units of measurements, material balance and energy fundamentals, classification of pollution, Air Pollution Control Methods & Equipment- sources and effects of air pollution –Sampling measurement and analysis of air pollutants- Control, Solid Waste Management-Sources & Classification –Solid Waste Disposal Options – Toxic, Waste Management, Water Pollution - sources of water pollutants– Classification and effects of Water Pollutants –Water pollution Laws and Standards, Environment For Comfort Living & Working - Comfort & Climate –Temperature, humidity and ventilation Control– AC load, Natural & Artificial Lighting, Noise Sources, control.			

Code	Course/Module Title	ECTS	Semester
UOBAB0301081	Power Plants	6	1
Class (hr/w)	**Lab./Prac./Tutor.**	**SSWL (hr/sem)**	**USSWL (hr/w)**
3	2/0/1	94	56
Description			
As part of conventional energy source it is vital for the student to learn about power plants therefore for this module will cover the			

following topics: Power Plants - Features, Components and Layouts - Working of Power Plants, Power Plant Economics, Boiler Classification - Boiler Types - Fire Tube & Water Tube Boilers - Fluidized Bed, Boilers - Positive Circulation Boilers - Thermal Liquid Heaters & Vaporizers, Classification - Features - Working - Performance of Steam Turbines - Losses in Steam, Turbines - Trouble Shooting, Classification and Comparison of Different Types Gas Turbine Power Plants Components. Combined cycle power plants. Hydroelectric power plant and geothermal energy for power plant operation.

Code	Course/Module Title	ECTS	Semester
UOBAB0301082	Energy Storage Systems	6	1
Class (hr/w)	**Lab./Prac./Tutor.**	**SSWL (hr/sem)**	**USSWL (hr/w)**
2	2/0/1	79	71
Description			
Need of energy storage, Different modes of Energy Storage. Potential energy: Pumped hydro storage; KE and Compressed gas system: Flywheel storage, compressed air energy storage; Electrical and magnetic energy storage: Capacitors, electromagnets; Chemical Energy storage: Thermo-chemical, Photochemical, bio-chemical, electro-chemical, fossil fuels and synthetic fuels. Hydrogen for energy storage. Solar Ponds for energy storage. Electrochemical Energy Storage Systems: Batteries: Primary, Secondary, Lithium, Solid-state and molten solvent batteries; Lead –Lead acid batteries; Nickel Cadmium Batteries; Advanced Batteries. Role of carbon nano-tubes in electrodes. Magnetic and Electric Energy Storage Systems: Superconducting Magnet Energy Storage (SMES) systems; Capacitor and Batteries: Comparison and application; Super capacitor: Electrochemical Double Layer Capacitor (EDLC), principle of working, structure, performance and application, role of activated carbon and carbon nano-tube. Sensible Heat Storage: SHS mediums; Stratified storage systems; Rock-bed storage systems; Thermal storage in buildings; Earth storage; Energy storage in aquifers; Heat storage in SHS systems; Aquifers storage. Latent Heat Thermal Energy Storage: Phase Change Materials (PCMs); Selection criteria of PCMs; Stefan problem; Solar thermal LHTES systems; Energy conservation through LHTES systems; LHTES systems in refrigeration and air-conditioning systems; Enthalpy formulation; Numerical heat transfer in melting and freezing process. Some Areas of Application of Energy Storage: Food preservation; Waste heat recovery; solar energy storage; Greenhouse heating; Power plant applications; Drying and heating for process industries.			

Code	Course/Module Title	ECTS	Semester
UOBAB0301083	Design of energy system by computer	6	1
Class (hr/w)	**Lab./Prac./Tutor.**	**SSWL (hr/sem)**	**USSWL (hr/w)**
2	0/3/0	79	71
Description			
Modelling and design of energy systems such as photovoltaic system, power system and thermal system. Use of computing tools to explore system dynamics, conduct simulation and test design concepts.			

Code	Course/Module Title	ECTS	Semester
UOBAB0301084	Nuclear energy	5	2
Class (hr/w)	**Lab./Prac./Tutor.**	**SSWL (hr/sem)**	**USSWL (hr/w)**
2	0/0/1	49	76
Description			
Unit One: Nuclear Reactions: Mechanism of nuclear fission - nuclides - radioactivity – decay chains – neutron reactions - the fission process - reactors - types of fast breeding reactor - design and construction of nuclear reactors - heat transfer techniques in nuclear reactors - reactor shielding. Reactor Materials: Nuclear Fuel Cycles - characteristics of nuclear fuels - Uranium - production and purification of Uranium - conversion to UF4 and UF6 - other fuels like Zirconium, Thorium - Berylium. Unit Three: Processing: Nuclear fuel cycles - spent fuel characteristics - role of solvent extraction in reprocessing – solvent extraction equipment. Unit Four: Separation of Reactor Products: Processes to be considered - 'Fuel Element' dissolution - precipitation process – ion exchange - redox - purex - TTA - chelation -U235 - Hexone - TBP and thorax Processes - oxidative slaging and electro - refinng - Isotopes - principles of Isotope separation. Waste Disposal and Radiation Protection: Types of nuclear wastes - safety control and pollution control and abatement - international convention on safety aspects - radiation hazards prevention.			

Code	Course/Module Title	ECTS	Semester
UOBAB0301085	Engineering professional Ethics	4	2
Class (hr/w)	**Lab./Prac./Tutor.**	**SSWL (hr/sem)**	**USSWL (hr/w)**
2	0/0/0	34	66
Description			

Code	Course/Module Title	ECTS	Semester
UOBAB0301086	Graduation project	3	2
Class (hr/w)	**Lab./Prac./Tutor.**	**SSWL (hr/sem)**	**USSWL (hr/w)**
1	0/2/0	49	26
Description			
Energy engineering related project will be assigned to students. These projects include experimental, numerical, and statistical methods. This project will enable the student to management the projects and time frame as well as dealing with the results and improve problem solving skills.			

Appendix (4)
MODULE DESCRIPTION FORM

الملحق (4)
وصف المادة الدراسية

UGI – level
Semester – One

Module Information معلومات المادة الدراسية					
Module Title	**Engineering Drawing and Auto-CAD I**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☐ **Lecture** ☒ **Lab** ☐ **Tutorial** ☒ **Practical** ☐ **Seminar**	
Module Code	**UOBAB0301011**				
ECTS Credits	**6**				
SWL (hr/sem)	١٥٠				
Module Level	UGI		**Semester of Delivery**	One	
Administering Department	Energy Engineering		**College**	College of Engineering\Al-Musayab	
Module Leader	Qais Hatem Mohammed		**e-mail**	met.qais.hatem@uobabylon.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 Objectives أهداف المادة الدراسية	1. Develop proficiency in *technical communication* and production of mechanical engineering drawings. 2. Develop skills in the preparation of working and assembly mechanical drawings. 3. *Develop an understanding of the properties, uses and production of materials used in the* manufacture of engineering components. 4. Provide knowledge of the different methods of production of engineering components. 5. *Develop skills in communicating technical information using illustrations, scaled models and working drawings* to solve engineering *design* problems. 6. Develop skills in applying and drawing principles to facilitate product development and manufacture. 7. Develop *proficiency* in the use of Computer-Aided Drafting (CAD) software, *instruments, media and reference materials* to produce engineering drawings. 8. Develop an interest in mechanical engineering as disciplines and careers. *9. Develop the capacity for critical and creative thinking, problem-solving, leadership and cooperative behaviors through authentic learning experiences.*

Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Know the principles of Lettering and Dimensioning. 2. Know how to construct standard engineering curves. 3. Know how to construct a number of different geometrical constructions. 4. Know how to project solids in orthographic projection. 5. Know how to use Computer-Aided Drafting software to produce drawings (user interface, one-dimensional figures "different lines"). 6. Know how to use Computer-Aided Drafting software to produce drawings (different two-dimensional figures "surfaces").
Indicative Contents المحتويات الإرشادية	**Indicative content includes the following**.[150] • Drawing Instruments and Accessories. [12 hrs.] • Lettering and Dimensioning Practices. [12 hrs.] • Geometrical Constructions. [46 hrs.] • Orthographic Projections. [40 hrs.] • Computer-Aided Drafting software (two-dimensional figures). [40 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 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	95	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	6
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	55	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	4
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	١٥٠		

Module Evaluation
تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	4	5% (20)	5 and 10	LO #3, #4, #5, and #6
	Class Assignment	15	1.5% (22.5)	Continuous	All
	Home work	15	0.5% (7.5)	Continuous	LO #3, #5 and #6
Summative assessment	**Midterm Exam**	2hr	10% (10)	7	LO #1 - #4
	Final Exam	٣hr	40% (40)	16	All
Total assessment			100%		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Drawing instruments and accessories, Computer-Aided Drafting software to produce drawings (user interface, one-dimensional figures “different lines”).
Week 2	Lettering and dimensioning practices, Computer-Aided Drafting software to produce drawings (user interface, one-dimensional figures “different lines”).
Week 3	Geometrical constructions, Computer-Aided Drafting software to produce drawings (user interface, one-dimensional figures “different lines”).
Week 4	Geometrical constructions, Computer-Aided Drafting software to produce drawings (user interface, one-dimensional figures “different lines”).
Week 5	Geometrical constructions, Computer-Aided Drafting software to produce drawings (user interface, one-dimensional figures “different lines”).
Week 6	Geometrical constructions, Computer-Aided Drafting software to produce drawings (user interface, one-dimensional figures “different lines”).
Week 7	Geometrical constructions, Computer-Aided Drafting software to produce drawings (different surfaces).
Week 8	Orthographic projections, Computer-Aided Drafting software to produce drawings (different surfaces).
Week 9	Orthographic projections, Computer-Aided Drafting software to produce drawings (different surfaces).
Week 10	Orthographic projections, Computer-Aided Drafting software to produce drawings (different surfaces).
Week 11	Orthographic projections, Computer-Aided Drafting software to produce drawings (different surfaces).
Week 12	Orthographic projections, Computer-Aided Drafting software to produce drawings (different surfaces).
Week 13	Orthographic projections, Computer-Aided Drafting software to produce drawings (different surfaces).
Week 14	Orthographic projections, Computer-Aided Drafting software to produce drawings (different surfaces).
Week 15	Orthographic projections, Computer-Aided Drafting software to produce drawings (different surfaces).
Week 16	**Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Drawing instruments and accessories, Computer-Aided Drafting software to produce drawings (user interface, one-dimensional figures “different lines”).
Week 2	Lettering and dimensioning practices, Computer-Aided Drafting software to produce drawings (user interface, one-dimensional figures “different lines”).
Week 3	Geometrical constructions, Computer-Aided Drafting software to produce drawings (user interface, one-dimensional figures “different lines”).
Week 4	Geometrical constructions, Computer-Aided Drafting software to produce drawings (user interface, one-dimensional figures “different lines”).
Week 5	Geometrical constructions, Computer-Aided Drafting software to produce drawings (user interface, one-dimensional figures “different lines”).
Week 6	Geometrical constructions, Computer-Aided Drafting software to produce drawings (user interface, one-dimensional figures “different lines”).

Week 7	Geometrical constructions, Computer-Aided Drafting software to produce drawings (different surfaces).
Week 8	Orthographic projections, Computer-Aided Drafting software to produce drawings (different surfaces).
Week 9	Orthographic projections, Computer-Aided Drafting software to produce drawings (different surfaces).
Week 10	Orthographic projections, Computer-Aided Drafting software to produce drawings (different surfaces).
Week 11	Orthographic projections, Computer-Aided Drafting software to produce drawings (different surfaces).
Week 12	Orthographic projections, Computer-Aided Drafting software to produce drawings (different surfaces).
Week 13	Orthographic projections, Computer-Aided Drafting software to produce drawings (different surfaces).
Week 14	Orthographic projections, Computer-Aided Drafting software to produce drawings (different surfaces).
Week 15	Orthographic projections, Computer-Aided Drafting software to produce drawings (different surfaces).

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Engineering drawing, Abdul Rasoul Al Khafaf, University of Technology, Baghdad, Iraq, 1990.	Yes
Recommended Texts	Handbook of engineering drawing and AutoCAD, Mohammad Abid Muslim Altufaily, University of Babylon, Iraq, 2007	Yes
Websites	https://youtu.be/zL1BA-mcjcc	

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	**Electrical Circuits**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☐ **Lecture** ☒ **Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**UOBAB0301012**				
ECTS Credits	**6**				
SWL (hr/sem)	150				
Module Level		UGI	**Semester of Delivery**		One
Administering Department		Type Dept. Code	**College**		Type College Code
Module Leader	Mohammed Ali Al-Shuraifi		**e-mail**		Msb.Mohammed.Ali@uobabylon.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 Objectives أهداف المادة الدراسية	1. To study Ohm's law 2. To study electrical circuits; series, parallel, and series-parallel in d.c. 3. To apply a methods of analysis on d.c. circuits 4. To apply electrical theorems on d.c. circuits 5. To understand the sinusoidal waveforms in electrical circuits. 6. To understand the response of Capacitor, Inductor, and resistor. 7. To understand the complex numbers. 8. To perform conversion between time domain and phasor domain and vice versa. 9. To apply the methods of analysis in ac circuits 10. To apply the circuit theorems in ac circuits 11. To understand power in ac circuits

Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Studying ohm's law 2. Studying types of circuits in d.c. and methods to analyze them. 3. Recognize ac components and their response; capacitor, inductor, and resistor. 4. List the various terms associated with ac electrical circuits. 5. Understand complex numbers in order to apply them in ac circuits 6. Discuss the average and the rms values. 7. Apply Kirchhoff's laws on ac circuits 8. Understand methods of analysis in ac circuits 9. Apply electrical theorems in ac circuits.
Indicative Contents المحتويات الإرشادية	**Indicative content includes the following.** Part A - Circuit Theory • studying d.c. electrical circuits. [12 hrs] • analyzing d.c. electrical circuits.[13 hrs] • Sinusoidal waveforms, average (dc) value, effective (rms) value [8 hrs] • Time domain and phasor domain. [8 hrs] • Complex numbers: rectangular and polar phorm [8 hrs] • Methods of circuit analysis and their applications on ac circuits; mesh and nodal methods. [12 hrs] • Electrical circuit theorems and their application on ac circuits: Superposition , Thevenin, And Norton. [12 hrs] • Power in ac circuits: power triangle, real power, reactive power, and apparent power; impedance triangle. [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 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	93	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	5
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	57	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	5
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 and 10	LO #1, #2 and #10, #11
	Assignments	2	10% (10)	2 and 12	LO #3, #4 and #6, #7
	Projects / Lab.	1	10% (10)	Continuous	All
	Report	1	10% (10)	13	LO #5, #8 and #10
Summative assessment	Midterm Exam	١hr	10% (10)	7	LO #1 - #7
	Final Exam	٢hr	50% (50)	16	All
Total assessment			100%		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Dc circuits; series , parallel , series-parallel
Week 2	Methods of analyzing d.c. circuits
Week 3	Electrical theorems
Week 4	Review of Kirchhoff's Laws on ac circuits
Week 5	Star delta and delta star conversion in ac circuits
Week 6	RLC circuits
Week 7	Mid-term Exam
Week 8	Series and parallel circuits
Week 9	Series – parallel circuits in ac circuits
Week 10	Methods of analysis in ac circuits I
Week 11	Methods of analysis in ac circuits II
Week 12	Electrical theorems in ac circuits I
Week 13	Electrical theorems in ac circuits II
Week 14	Power and power triangle
Week 15	Power , apparent power , reactive and real power
Week 16	**Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: series-parallel dc circuits
Week 2	Lab 2: Norton's theorem
Week 3	Lab 3: RLC circuits
Week 4	Lab 4: Kirchhoff's laws
Week 5	Lab 5: mesh method
Week 6	Lab 6: superposition theorem
Week 7	Lab 7: Thevenin theorem

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Introductory circuit analysis by Boylestad	Yes
Recommended Texts	Introductory circuit analysis by Boylestad	Yes
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 Information معلومات المادة الدراسية					
Module Title	**Mathematics I**			**Module Delivery**	
Module Type	S			☒ **Theory** ☐ **Lecture** ☐ **Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**UOBAB0301013**				
ECTS Credits	**6**				
SWL (hr/sem)	**150**				
Module Level		UGI	**Semester of Delivery**		One
Administering Department			**College**		
Module Leader	Mohammed Abd Aldeem		**e-mail**	met.moh.abdaldaaem@uobabylon.edu.iq	
Module Leader's Acad. Title		Assist. Lecturer	**Module Leader's Qualification**		MSC
Module Tutor			**e-mail**		
Peer Reviewer Name	None		**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		**Semester**	
Co-requisites module		**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	**After completing the course, students should be able to**: 1) Enable the pupil to learn the concepts of mathematics and applications in his work. 2) To study the characteristics and properties of number sets, and obtain the number systems. 3) To understand the concept of function, to learn draw the graph of functions, to know the lists types of functions. 4) Study the meaning of limit and continuous function. 5) To understand the meaning of derivative function and applications. 6) Study the transcendental function. 7) Study the Unit vector, vector equation, cross product, dot product. 8) To knows the meaning of complex number.

Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1) Describe the characteristics and properties of number sets, and obtain the number systems. 2) Describe and State the concept of function, draw the graph of functions, the lists types of functions. 3) To understands the meaning of limit and continuous function. 4) To knows the meaning of derivative function and applications. 5) Describe the transcendental function. 6) Describe the matrix and its operations and to know the determent of its. 7) Describe the Unit vector, vector equation, cross product, dot product. 8) To understands the meaning of complex number.
Indicative Contents المحتويات الإرشادية	**Indicative content includes the following**. • Type of sets, type of interval, Cartesians plain. The domain and rang of functions, even and odd functions. Drawing curved function, shifting the graph. limit from the left and right. [20 hr] • The concept of continuous function, Algebraic operations on continuous functions. Methods of derivation, the chain rule. Applications on derivatives. Kind of exponential functions. Types of trigonometric functions. The inverse of the trigonometric functions. Kind of Hyperbolic functions. [20 hr] • Types of matrices, operations on matrices. Use matrices in solving linear systems of equations. Meaning vector, algebraic properties of vectors. Vector equation, cross product, dot product. Properties of complex numbers, the representation of the complex number. [20 hr]

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	64	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	86	**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	20% (20)	5 and 10	LO #1, #2 and #10, #11
	Assignments	2	10% (10)	2 and 12	LO #3, #4 and #6, #7,#8
	Projects.				
	Report	1	10% (10)		
Summative assessment	Midterm Exam	2hr	10% (10)	7	LO #1 - #7
	Final Exam	3hr	50% (50)	16	All
Total assessment			100%		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	System numbers.
Week 2	The functions and its kinds.
Week 3	The graph of the function.
Week 4	Limit function.
Week 5	Continuous functions.
Week 6	Derivatives.
Week 7	Applications on derivatives. (Mid-term Exam)
Week 8	Exponential functions.
Week 9	The inverse trigonometric functions.
Week 10	Hyperbolic functions.
Week 11	Matrices and their types.
Week 12	Solving systems of linear equations.
Week 13	Vectors.
Week 14	The operations on the Vector.
Week 15	Complex numbers.
Week 16	**Preparatory week before the final Exam**

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	Available in the Library?
Required Texts	George B. Thomas Jr, Weir Joel R. Hass 'Calculus' (V.12), 2014.	Yes
Recommended Texts	1. Haward Anton" Calculus and analytic geometry". 2. Schoms series " Theory and problems of calculus".	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 Information معلومات المادة الدراسية					
Module Title	**Physics**			**Module Delivery**	
Module Type	S			☒ **Theory** ☐ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	UOBAB0301014				
ECTS Credits	**5**				
SWL (hr/sem)	**125**				
Module Level	UGI		**Semester of Delivery**	One	
Administering Department	Type Dept. Code		**College**	Type College Code	
Module Leader	Ali Mohammed Ijam		**e-mail**	ali.ijam@uobabylon.edu.iq	
Module Leader's Acad. Title	Lecturer		**Module Leader's Qualification**	Ph.D.	
Module Tutor			**e-mail**		
Peer Reviewer Name	None		**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 Objectives أهداف المادة الدراسية	1. Analyze the atomic structure of matter at its most fundamental. 2. Recognize the state of matter and its properties. 3. Understand the forms of energy. 4. Solve problems that call for the application of conservation of energy. 5. Know the classification of the semiconductors and the mechanism behind them. 6. Explain the basic properties of light and describe some of its applications in engineering.

Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Understanding the basic concepts and definitions is important in any field of study. 2. Learning the properties of individual atoms and molecules, as well as how they interact with each other. 3. knowing the physical and chemical properties of each state, such as gas, liquid, and solid, as well as understanding how the atoms and molecules interact with each other in the various states. 4. Be familiar with how the forms of energy interact with one another and how they are used. 5. Understanding how energy can be converted from one form to another as well as familiarity with the equations involved. 6. Learning how semiconductors are classified and what the mechanisms are behind each type of semiconductor. 7. Applying the light fundamental principles and how engineers are able to create complex technological solutions.
Indicative Contents المحتويات الإرشادية	**Indicative content includes the following**. • Some basic concepts and definitions, how atomic structure is formed and interatomic bonding energy and classification, properties of matter, state of matter, energy sources, kinetic energy, and work. [23 hr] • Potential energy, thermal properties of matter, how heat and law of thermodynamics applied, what are the fluid characteristics, electric field, and potential. [22 hr] • Classifications of Conductor and insulator materials, semiconductors, propagation of light and optics characteristics, and elements of solid-state physics. [15 hr]

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	This module will be taught in such a way that students will be compelled to participate in the exercises and their critical thought skills will be refined and expanded through participation. Classes and interactive tutorials will be used in order to reach this goal, as well as considering the types of simple experiments involving sampling activities that the learners might find interesting as well. The module will also include group activities, which will encourage collaboration and the exchange of ideas. This will help to create an engaging learning experience for the students and will also help them to develop their communication skills.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	64	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	61	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	4
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 and 10	LO #1, #2 and #10, #11
	Assignments	2	10% (10)	2 and 12	LO #3, #4 and #6, #7
	Projects / Lab.	1	10% (10)	Continuous	All
	Report	1	10% (10)	13	LO #5, #8 and #10
Summative assessment	Midterm Exam	2hr	10% (10)	7	LO #1 - #7
	Final Exam	3hr	50% (50)	16	All
Total assessment			100%		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Some basic concepts and definitions
Week 2	Atomic structure and interatomic bonding
Week 3	Properties of matter
Week 4	State of matter
Week 5	Energy sources
Week 6	Kinetic Energy and work
Week 7	Potential energy (Mid-term Exam)
Week 8	Thermal properties of matter
Week 9	Heat and law of thermodynamics
Week 10	Fluids
Week 11	Electric field and potential
Week 12	Conductor and insulator materials
Week 13	Semiconductors
Week 14	Lights and optics
Week 15	Elements of solid-state physics
Week 16	**Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: Photon energy
Week 2	Lab 2: Data analysis for calculating Plank's constant
Week 3	Lab 3: Energy distribution
Week 4	Lab 4: Electrical properties of insulated materials
Week 5	Lab 4: Light interaction with matter

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Halliday, D., Resnick, R., & Walker, J. (2013). Fundamentals of physics. John Wiley & Sons.	Yes
Recommended Texts	Radi, H., & Rasmussen, J. O. (2013). Principles of physics. Springer.	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 Information معلومات المادة الدراسية					
Module Title	Fundamental of Computer			**Module Delivery**	
Module Type	B			☒ **Theory** ☐ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	UOBAB0301015				
ECTS Credits	4				
SWL (hr/sem)	100				
Module Level	UGI		**Semester of Delivery**	One	
Administering Department	Type Dept. Code		**College**	Type College Code	
Module Leader	Omar Ahmed Naeem		**e-mail**	msb.omar.alkawak@uobabylon.edu.iq	
Module Leader's Acad. Title	Assistant Lecturer		**Module Leader's Qualification**	Msc	
Module Tutor			**e-mail**		
Peer Reviewer Name	None		**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 Objectives أهداف المادة الدراسية	The computer science curriculum aims to introduce the student to computer science and the skills related to this subject. The main purpose of the course is to introduce the student to an idea about the computer and its components and how each of its parts works through an explanation of the input units, the central processing unit, the input units, the storage units, and the types of operating systems and programs Microsoft Office and how to connect to the Internet and identify and protect against virus risks.

Module Learning Outcomes مخرجات التعلم للمادة الدراسية	A- Cognitive objectives A1- During the school year, the student learns the basics of computer science. A2- Enabling the student to know the main principles of the most prominent concepts of computer science, their sources and types, and the mechanisms used for their purpose. A 3- Enabling the student to know all the basics that he uses in the scientific subject A 4- Definition of computer, its development history and generations A 5- An explanation of the computer system with all its elements and systems A6- Introducing the student to the input unit, its principles of work, its types, and the work of the basic office programs A 7- The central processing unit, its parts, how each part works, the output unit, its working principles and types b- The skill objectives of the subject B1 - Familiarity with developments in the field of computers B2 - Familiarity with computer components B3 - Enabling the student to understand every part of the computer, how it works, and the work of the basic office programs B4- Giving the student an opportunity to explain a small part of the class to his classmates to enhance his self-confidence. B5- Solve a small part of the homework to urge the students to complete the solution, give class assignments, and make groups to solve these assignments.
Indicative Contents المحتويات الإرشادية	The students will be able to identify the values, trends and patterns of behavior that uphold the ethics of the profession and work to adhere to them after graduation. 1-Urging the student to understand the objective of studying the subject in general. 2-Urging the student to think about how to develop oneself in the field of computers. 3 -Making the student able to deal with the computers and how to use the programs in accordance with the rules and regulations of engineering.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	1. The teacher prepares lectures on the subject in soft electronic form and presents them to the students. 2. The teacher gives lectures in detail. 3. the teacher requests periodic reports and homework on the basic subjects of the subject. 4. Academic methods and lectures 5. Dialogue modalities 6. Use projectors 7. Providing the student with basic and secondary topics related to computer work 8. Translating theoretical topics and vocabulary related to computer technologies 9. Requiring the student to follow developments in computer science

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	49	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	3
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	51	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	1
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)	3 and 15	LO #1, #2 and #10, #11
	Assignments	2	10% (10)	2 and 15	LO #3, #4 and #6, #7
	Projects / Lab.	1	10% (10)	Continuous	All
	Report	1	10% (10)	13	LO #5, #8 and #10
Summative assessment	Midterm Exam	2hr	10% (10)	7	LO #1 - #7
	Final Exam	3hr	50% (50)	16	All
Total assessment			100%		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Computers: their generations, components: hardware and software
Week 2	(Input and output) (system software and application software).
Week 3	Windows operating system Windows concept, advantages, basic requirements
Week 4	Windows The concept of a window for any program and identifying its main components, folders, and files and how to deal with them
Week 5	Windows Learning about My Computer and Control Panel components
Week 6	Output devices such as (printer and ways to deal with it)
Week 7	Word (document building and formatting methods)
Week 8	Word (document building and formatting methods)
Week 9	**Midterm Exam**
Week 10	Excel program (data building, processing, and ways to extract it)
Week 11	Excel program (data building, processing, and ways to extract it)
Week 12	PowerPoint program (building and coordinating presentations)
Week 13	PowerPoint program (building and coordinating presentations)
Week 14	The concept of computer viruses: how to infect, types and treatment
Week 15	The Internet: a definition of how to deal with the Internet, Internet browsers, web searches and e-mail
Week 16	**Preparatory week before the final Exam**

المنهاج الاسبوعي للمختبرDelivery Plan (Weekly Lab. Syllabus)	
	Material Covered
Week 1	Computers: their generations, components: hardware and software
Week 2	(Input and output) (system software and application software).
Week 3	Windows operating system Windows concept, advantages, basic requirements
Week 4	Windows The concept of a window for any program and identifying its main components, folders, and files and how to deal with them
Week 5	Windows Learning about My Computer and Control Panel components
Week 6	Output devices such as (printer and ways to deal with it)
Week 7	Word (document building and formatting methods)
Week 8	Word (document building and formatting methods)

Week 9	**Midterm Exam**
Week 10	Excel program (data building, processing, and ways to extract it)
Week 11	Excel program (data building, processing, and ways to extract it)
Week 12	PowerPoint program (building and coordinating presentations)
Week 13	PowerPoint program (building and coordinating presentations)
Week 14	The concept of computer viruses: how to infect, types and treatment
Week 15	The Internet: a definition of how to deal with the Internet, Internet browsers, web searches and e-mail
Week 16	**Preparatory week before the final Exam**

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Computer basics and office applications / 4 parts - Prof. Dr. Ghassan Hamid Abdel Majeed and Dr. Ziyad Muhammad Abboud and others.	No
Recommended Texts	1. William Stallings, Computer Organization & Architecture, Sixth edition, Person Education 2. Donald H. Sandersz, Computer today, Second edition, McGraw –hill 3. Lectures provided by the subject teacher 4. Books available in the college library	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 Information معلومات المادة الدراسية					
Module Title	Arabic Language			**Module Delivery**	
Module Type	B			☒ Theory ☐ Lecture ☐ Lab ☐ Tutorial ☐ Practical ☐ Seminar	
Module Code	UOBAB0301016				
ECTS Credits	2				
SWL (hr/sem)	50				
Module Level	UGI		**Semester of Delivery**	One	
Administering Department	Type Dept. Code		**College**	Type College Code	
Module Leader	Noor Mohammed Jasim		**e-mail**	msb.noor.mohammed@uobabylon.edu.iq	
Module Leader's Acad. Title	Assist 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 Objectives
أهداف المادة الدراسية

١. اتقان اللغة: الهدف الرئيسي من أهداف الوحدة في اللغة العربية هو مساعدة المتعلمين على تطوير الكفاءة في القراءة والكتابة والتحدث والاستماع إلى اللغة العربية. وهذا يشمل تحسين المفردات والقواعد والنطق ومهارات الفهم.
٢. مهارات الاتصال: هدف آخر هو تعزيز قدرة المتعلمين على التواصل الفعال باللغة العربية. يتضمن ذلك التركيز على الاستخدام العملي للغة ، مثل الانخراط في المحادثات والتعبير عن الآراء وطرح الأسئلة والإجابة عليها والمشاركة في أنشطة التواصل المختلفة.
٣. التفاهم الثقافي: قد تهدف أهداف الوحدة أيضًا إلى تعزيز التفاهم الثقافي والوعي بالعالم العربي. ويشمل ذلك تعريف المتعلمين بالعادات والتقاليد والأدب والتاريخ والجوانب الاجتماعية المرتبطة بالدول الناطقة باللغة العربية.
٤. استخدام اللغة الوظيفية: يمكن أن يكون الهدف من أهداف الوحدة هو تزويد المتعلمين بالمهارات اللغوية اللازمة لأداء مهام أو وظائف محددة باللغة العربية. قد يتضمن ذلك تعلم المفردات والعبارات المتعلقة بموضوعات مثل السفر والتسوق وتناول الطعام والرعاية الصحية والتفاعلات التجارية.
٥. الدقة اللغوية: قد تؤكد أهداف الوحدة على تطوير الدقة النحوية والاستخدام السليم للغة. يتضمن ذلك تعلم قواعد وهياكل قواعد اللغة العربية ، وبناء الجملة ، والصرف لإنتاج جمل متماسكة وخالية من الأخطاء.
٦. التعلم المستقل: هدف آخر هو تعزيز قدرة المتعلمين على دراسة واستكشاف اللغة العربية بشكل مستقل خارج الفصل الدراسي. يمكن أن يشمل ذلك تشجيع التعلم الذاتي ، وتوفير الموارد لمزيد من الممارسة ، وتطوير استراتيجيات لاكتساب اللغة بشكل فعال.
٧. التقييم والتقدم: قد تهدف أهداف الوحدة أيضًا إلى تقييم تقدم المتعلمين وتقديم ملاحظات حول مهاراتهم في اللغة العربية. يسمح هذا لكل من المتعلمين والمدربين بتقييم إنجازاتهم وتحديد مجالات التحسين

Module Learning Outcomes مخرجات التعلم للمادة الدراسية	١. الفهم السمعي: إظهار القدرة على فهم وفهم اللغة العربية المنطوقة عبر مجموعة من الموضوعات والسياقات ، بما في ذلك المحادثات والعروض التقديمية والتسجيلات الصوتية. ٢. الفهم القرائي: إظهار القدرة على قراءة وفهم النصوص العربية المكتوبة بمستويات مختلفة من الصعوبة ، مثل المقالات والقصص والمواد الأصلية ، واستخراج المعلومات ذات الصلة. ٣. إتقان التحدث: التواصل الفعال باللغة العربية من خلال التعبير عن الأفكار والآراء والمعلومات في شكل منطوق. الانخراط في المحادثات والمشاركة في المناقشات وتقديم العروض باستخدام المفردات والقواعد والنطق المناسب. ٤. إتقان الكتابة: إنتاج نصوص مكتوبة باللغة العربية ، مثل المقالات والتقارير ورسائل البريد الإلكتروني والرسائل ، بوضوح وتماسك ودقة نحوية. قم بتطبيق اصطلاحات اللغة المناسبة ، بما في ذلك التهجئة وعلامات الترقيم وبنية الفقرة. ٥. المفردات والقواعد: إظهار مجموعة واسعة من المفردات وفهم قواعد قواعد اللغة العربية وهياكلها. استخدم المفردات المناسبة للتعبير عن الأفكار والأفكار بدقة ، وتطبيق القواعد النحوية بشكل فعال في الاتصال الكتابي والمنطوق. ٦. الوعي الثقافي: إظهار فهم للجوانب الثقافية للبلدان الناطقة باللغة العربية ، بما في ذلك العادات والتقاليد والأعراف الاجتماعية. التعرف على الاختلافات الثقافية واحترامها وتطبيق المعرفة الثقافية بشكل مناسب في استخدام اللغة. ٧. الطلاقة اللغوية: تنمية الطلاقة في اللغة العربية من خلال التحدث والرد بشكل عفوي ، دون تردد مفرط. أظهر القدرة على الحفاظ على المحادثة والتفاوض بشأن المعنى والتعامل مع مواقف الاتصال المختلفة بثقة. ٨. التفكير النقدي: تطبيق مهارات التفكير النقدي لتحليل وتقييم النصوص العربية ، بما في ذلك المقالات الإخبارية ، والأعمال الأدبية ، والمواد الثقافية. صياغة الآراء ودعمها ، وإقامة الروابط ، وإظهار الفهم وراء مستوى الفهم السطحي. ٩. التعلم المستقل: تحمل مسؤولية التعلم الذاتي من خلال استخدام الموارد والاستراتيجيات لتطوير إتقان اللغة العربية. إظهار القدرة على الانخراط في التعلم الذاتي للغة والبحث عن فرص للتحسين المستمر. ١٠. التواصل بين الثقافات: الانخراط في التواصل الفعال بين الثقافات من خلال إظهار فهم الاختلافات الثقافية ، وتكييف استخدام اللغة وفقًا لذلك ، وإظهار الاحترام لوجهات النظر المتنوعة.
Indicative Contents المحتويات الإرشادية	المبتدأ والخبر أن يكون الطالب جملة فيها مبتدأ وخبر , التصويبات اللغوية أن يتعرف الطالب على التصويبات اللغوية علامات الترقيم أن يستعمل الطالب علامات الترقيم وجوب فتح همزه ان وكسرها أن يتعرف الطالب موقع فتح همزة ان وكسرها الادب القصصي أن يتعرف الطالب على الادب القصصي الادب العربي زيادة الثروة اللغوية للطالب الشعر الحر والشعر العمودي أن يفرق الطالب بين الشعر العمودي والحر العدد أن يكتب الطالب العدد بشكل صحيح حافظ ابراهيم أن يترجم الطالب لحياة الشاعر حافظ ابراهيم بدر شاكر السياب أن يترجم الطالب لحياة الشاعر بدر شاكر السياب الجواهري أن يترجم الطالب لحياة الشاعر الجواهري همزة القط أن يستخرج الطالب همزة القطع

Learning and Teaching Strategies
استراتيجيات التعلم والتعليم

Strategies	النهج التواصلي: التأكيد على استخدام اللغة العربية للتواصل الهادف. شجع المتعلمين على الانخراط في محادثات حقيقية ولعب الأدوار وأنشطة التواصل التي تعكس مواقف الحياة الواقعية. توفير فرص للتفاعل الهادف باللغة العربية لتطوير مهارات التحدث والاستماع. المهارات المتكاملة: دمج المهارات اللغوية الأربع (الاستماع والتحدث والقراءة والكتابة) في عملية التدريس والتعلم. قم بإنشاء أنشطة تسمح للمتعلمين بممارسة هذه المهارات وتعزيزها في وقت واحد. على سبيل المثال ، قراءة نص بصوت عالٍ ومناقشته ثم كتابة رد. مواد أصلية: دمج المواد العربية الأصيلة ، مثل المقالات الإخبارية والأدب والأغاني ومقاطع الفيديو والبودكاست ، في المناهج الدراسية. تعرض هذه المواد المتعلمين لاستخدام اللغة الواقعية والجوانب الثقافية للمجتمعات الناطقة باللغة العربية ، مما يعزز كفاءتهم اللغوية وفهمهم الثقافي. التعلم السياقي: تعليم اللغة العربية في سياقات ذات مغزى تتعلق بحياة المتعلمين أو مجالات اهتمامهم. استخدم الموضوعات والموضوعات والمواقف ذات الصلة لجعل تجربة تعلم اللغة أكثر جاذبية ووثوقية للمتعلمين. مناهج متعددة الوسائط: استخدم مجموعة متنوعة من الموارد والوسائط لتلبية أنماط التعلم المختلفة. اجمع بين الأنشطة البصرية والسمعية والحركية لتعزيز تعلم اللغة. قم بدمج أدوات الوسائط المتعددة وتطبيقات تعلم اللغة والموارد عبر الإنترنت والأنشطة التفاعلية لإنشاء بيئة تعليمية جذابة. التعلم القائم على المهام: تنظيم تعلم اللغة حول المهام الهادفة التي تتطلب من المتعلمين استخدام اللغة العربية لتحقيق أهداف محددة. يمكن أن تشمل المهام التخطيط لرحلة أو وصف تجربة شخصية أو المشاركة في مناقشة. يعزز هذا النهج استخدام اللغة ومهارات حل المشكلات

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	٣٠	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	٢
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	٢٠	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	١
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	٥٠		

Module Evaluation
تقييم المادة الدراسية

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

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
Week 1	أن يكون الطالب جملة فيها مبتدأ وخبر
Week 2	أن يتعرف الطالب على التصويبات اللغوية
Week 3	أن يستعمل الطالب علامات الترقيم
Week 4	أن يتعرف الطالب موقع فتح همزة ان وكسرها
Week 5	أن يتعرف الطالب على الادب القصصي
Week 6	الامتحان الفصلي
Week 7	زيادة الثروة اللغوية للطالب
Week 8	أن يفرق الطالب بين الشعر العمودي والحر
Week 9	أن يكتب الطالب العدد بشكل صحيح
Week 10	أن يترجم الطالب لحياة الشاعر حافظ ابراهيم
Week 11	أن يترجم الطالب لحياة الشاعر بدر شاكر السياب
Week 12	أن يترجم الطالب لحياة الشاعر الجواهري
Week 13	أن يستخرج الطالب همزة القطع
Week 14	أن يستعمل الطالب همزة الوص
Week 15	أن يكون الطالب جملة فيها مبتدأ وخبر
Week 16	الامتحان النهائي

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	١- عليوي ، سعد حسن ، النحو الوسيط ، ط١ ، دار صفاء للنشر والتوزيع ، عمان –الاردن ، ٢٠١٥. ٢- النحوي ، ابن عقيل ، شرح ابن عقيل على الفية ابن مالك ، ط١ ، دار الكتب العلمية ، بيروت - لبنان ، ٢٠٠٦. ضيف ، شوقي ، تاريخ الادب العربي ، ط٢، دار المعارف للطباعة ، القاهرة ، ٢٠٠٦.	Yes
Recommended Texts	أ) الانصاري ، ابن هشام ، شرح قطر الندى وبل الصدى ، ط١ ، دار الهلال للنشر والتوزيع ، بيروت – لبنان ، ٢٠٠٩. ب) السامرائي ، فاضل صالح ، معاني النحو ، دار ابن كثير للنشر والتوزيع ، بيروت – لبنان ، ٢٠١٧.	No
Websites	وكيبيديا ، منتديات اللغة العربية	

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.

UGI – level
Semester – Two

Module Information معلومات المادة الدراسية			
Module Title	**Engineering Drawing and Auto-CAD II**	**Module Delivery**	
Module Type	**S**	☒ **Theory** ☐ **Lecture** ☒ **Lab** ☐ **Tutorial** ☒ **Practical** ☐ **Seminar**	
Module Code	UOBAB0301021		
ECTS Credits	**6**		
SWL (hr/sem)	١٥٠		
Module Level	UGI	**Semester of Delivery**	Two
Administering Department	Energy Engineering	**College**	College of Engineering\Al-Musayab
Module Leader	Qais Hatem Mohammed	**e-mail**	met.qais.hatem@uobabylon.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 Objectives أهداف المادة الدراسية	1)Develop proficiency in *technical communication* and production of mechanical engineering drawings. 2)Develop skills in the preparation of working and assembly mechanical drawings. 3)*Develop an understanding of the properties, uses and production of materials used in the* manufacture of engineering components. 4)Provide knowledge of the different methods of production of engineering components. 5)*Develop skills in communicating technical information using illustrations, scaled models and working drawings* to solve engineering *design* problems. 6)Develop skills in applying and drawing principles to facilitate product development and manufacture. 7)Develop *proficiency* in the use of Computer-Aided Drafting (CAD) software, *instruments, media and reference materials* to produce engineering drawings. *8)*Develop an interest in mechanical engineering as disciplines and careers. *9)Develop the capacity for critical and creative thinking, problem-solving, leadership and cooperative behaviors through authentic learning experiences.*

Module Learning Outcomes مخرجات التعلم للمادة الدراسية	• Know how to represent solids in pictorial projections. • Know how to produce working and assembly drawings. • Know how to use Computer-Aided Drafting software to produce drawings (different three-dimensional figures "solid figures"). • Know how to project auxiliary views. • Know how to prepare drawings with sectional views.
Indicative Contents المحتويات الإرشادية	**Indicative content includes the following.**[150] • Represent solids in pictorial projections. [20 hrs.] • Assembly drawings. [40 hrs.] • Project auxiliary views. [20 hrs.] • Prepare drawings with sectional views. [30 hrs.] • Computer-Aided Drafting software (three-dimensional figures). [40 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 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	80	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	6
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	70	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	4
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	١٥٠		

Module Evaluation
تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	4	5% (20)	5 and 10	LO #2, #4, and two in #5
	Class Assignment	15	1.5% (22.5)	Continuous	All
	Home work	15	0.5% (7.5)	Continuous	LO #3, #5 and #6
Summative assessment	**Midterm Exam**	2hr	10% (10)	7	LO #1 - #4
	Final Exam	٣hr	40% (40)	16	All
Total assessment			100%		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Represent solids in pictorial projections, Computer-Aided Drafting software to produce drawings (three-dimensional).
Week 2	Represent solids in pictorial projections, Computer-Aided Drafting software to produce drawings (three-dimensional).
Week 3	Assembly drawings, Computer-Aided Drafting software to produce drawings (three-dimensional).
Week 4	Assembly drawings, Computer-Aided Drafting software to produce drawings (three-dimensional).
Week 5	Assembly drawings, Computer-Aided Drafting software to produce drawings (three-dimensional).
Week 6	Assembly drawings, Computer-Aided Drafting software to produce drawings (three-dimensional).
Week 7	Assembly drawings, Computer-Aided Drafting software to produce drawings (three-dimensional).
Week 8	Assembly drawings, Computer-Aided Drafting software to produce drawings (three-dimensional).
Week 9	Project auxiliary views, Computer-Aided Drafting software to produce drawings (three-dimensional).
Week 10	Project auxiliary views, Computer-Aided Drafting software to produce drawings (three-dimensional).
Week 11	Prepare drawings with sectional views, Computer-Aided Drafting software to produce drawings (three-dimensional).
Week 12	Prepare drawings with sectional views, Computer-Aided Drafting software to produce drawings (three-dimensional).
Week 13	Prepare drawings with sectional views, Computer-Aided Drafting software to produce drawings (three-dimensional).
Week 14	Prepare drawings with sectional views, Computer-Aided Drafting software to produce drawings (three-dimensional).
Week 15	Prepare drawings with sectional views, Computer-Aided Drafting software to produce drawings (three-dimensional).
Week 16	**Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Represent solids in pictorial projections, Computer-Aided Drafting software to produce drawings (three-dimensional).
Week 2	Represent solids in pictorial projections, Computer-Aided Drafting software to produce drawings (three-dimensional).
Week 3	Assembly drawings, Computer-Aided Drafting software to produce drawings (three-dimensional).
Week 4	Assembly drawings, Computer-Aided Drafting software to produce drawings (three-dimensional).
Week 5	Assembly drawings, Computer-Aided Drafting software to produce drawings (three-dimensional).
Week 6	Assembly drawings, Computer-Aided Drafting software to produce drawings (three-dimensional).
Week 7	Assembly drawings, Computer-Aided Drafting software to produce drawings (three-dimensional).
Week 8	Assembly drawings, Computer-Aided Drafting software to produce drawings (three-dimensional).
Week 9	Project auxiliary views, Computer-Aided Drafting software to produce drawings (three-dimensional).

Week 10	Project auxiliary views, Computer-Aided Drafting software to produce drawings (three-dimensional).
Week 11	Prepare drawings with sectional views, Computer-Aided Drafting software to produce drawings (three-dimensional).
Week 12	Prepare drawings with sectional views, Computer-Aided Drafting software to produce drawings (three-dimensional).
Week 13	Prepare drawings with sectional views, Computer-Aided Drafting software to produce drawings (three-dimensional).
Week 14	Prepare drawings with sectional views, Computer-Aided Drafting software to produce drawings (three-dimensional).
Week 15	Prepare drawings with sectional views, Computer-Aided Drafting software to produce drawings (three-dimensional).

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Engineering drawing, Abdul Rasoul Al Khafaf, University of Technology, Baghdad, Iraq, 1990.	Yes
Recommended Texts	Handbook of engineering drawing and AutoCAD, Mohammad Abid Muslim Altufaily, University of Babylon, Iraq, 2007	Yes
Websites	https://youtu.be/eIPHvDcMx-w	

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

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Module Information معلومات المادة الدراسية					
Module Title	**Engineering Mechanics**			**Module Delivery**	
Module Type	**S**			☒ **Theory** ☐ **Lecture** ☐ **Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	UOBAB0301022				
ECTS Credits	٦				
SWL (hr/sem)	١٥٠				
Module Level	UGI		**Semester of Delivery**	Two	
Administering Department	Type Dept. Code		**College**	Type College Code	
Module Leader	Bashar Abid Hamza		**e-mail**	met.basher.abid@uobabylon.edu.iq	
Module Leader's Acad. Title	Assistant 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 Objectives أهداف المادة الدراسية	After completing the course, students should be able to 1. Describe the characteristics and properties of forces and moments, analyze the force system, and obtain the resultant and equivalent force systems, 2. State the conditions of equilibrium, draw free body diagrams (FBDs), analyze and solve problems involving rigid bodies in equilibrium, 3. Draw FBDs, analyze and solve structural and mechanical systems of rigid bodies in equilibrium, 4. Draw FBDs, analyze and solve structural and mechanical systems with distributed loads in equilibrium, 5. Describe the mechanism and characteristics of dry friction, draw FBDs, analyze and solve structural and mechanical systems with friction in equilibrium, 6. Describe the physical meanings of idealized problems in Statics and approximate real-life Situations to idealized problems 6- Describe the equation of kinematics and solve problems. 7- Describe and analysis the equation of kinetics and solve problems.

Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1- To understand Principle engineering mechanics 2- enable student to study and analyze force systems 3- enable student to Modeling of supports and free body diagram 4- Enable student to study equilibrium of force systems applied on bodies. 5- Enable student to locate the centroid of area. 6- Enable student to determine the moment of inertia of area. 7- Enable student to analyze and solve structural and mechanical systems with friction in equilibrium. 8- Enable student to compare between kinematics and kinetics of particles 9- Enable student to study and analysis kinematics (rectilinear/curvilinear motion). 10 - Enable student to study and analyze the kinetics of particles (equation of motion, work and energy , and impulse and momentum)
Indicative Contents المحتويات الإرشادية	**Indicative content includes the following.** • Introduction, perpendicular components of forces, moment and couple of forces and resultant of force system. **[١٦hrs.]** • Modeling of supports, Draw free body diagram. **[٥hrs.]** • Determination Centroid of lines, area, and volume using integration. **[٥hrs.]** • Determination Centroid of lines, area, and volume using tables. **[٣hrs.]** • Determination moment of inertia using integration. **[٣hrs.]** • Determination moment of inertia using tables. **[٣hrs.]** • Evaluation of friction forces.**[٥hrs.]**

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	٦٤	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	٤
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	٨٦	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	٦
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	١٥٠		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	5% (5)	2 and 4	LO #1 and #2
	Assignments	2	5% (5)	4 and 8	LO #1 - #5
	Projects / Lab.				
	Report				
Summative assessment	Midterm Exam	2hr	30% (30)	4 and 8	LO #1 - #5
	Final Exam	٣hr	40% (40)	16	All
Total assessment			100%		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Introduction
Week 2	Force 2D (perpendicular components)
Week 3	Force 2D (moment and couple)
Week 4	Force 2D (resultant)
Week 5	Equilibrium
Week 6	Centroid lines, area, and volume
Week 7	Centroid lines, area, and volume
Week 8	Moment of inertia
Week 9	Moment of inertia
Week 10	Friction
Week 11	Dynamics –Kinematics of particles –(1) –Rectilinear motion
Week 12	(2) Curvilinear Motion
Week 13	Kinetics of Particles –(1) Equation of Motion
Week 14	(2)- Work and Energy
Week 15	3- Impulse and Momentum.
Week 16	**Preparatory week before the final Exam**

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	Available in the Library?
Required Texts	J. L. Meriam and L. G. Kraige, 'Engineering Mechanics: Statics (V.1), 7th edition, Wiley 2012.	Yes
Recommended Texts	R. C. Hibbeler, Engineering Mechanics: STATICS (SI Edition), 14th edition, Prentice Hall 2016.	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 Information معلومات المادة الدراسية					
Module Title	**Mathematic II**			**Module Delivery**	
Module Type	S			☒ **Theory** ☐ **Lecture** ☐ **Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	UOBAB0301022				
ECTS Credits	**6**				
SWL (hr/sem)	**150**				
Module Level		UGI	**Semester of Delivery**		Two
Administering Department			**College**		
Module Leader	Mohammed Abd Aldeem		**e-mail**	met.moh.abdaldaaem@uobabylon.edu.iq	
Module Leader's Acad. Title		Assist . Lecturer	**Module Leader's Qualification**		MSC
Module Tutor			**e-mail**		
Peer Reviewer Name	None		**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	Mathematic I	**Semester**	One
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	After completing the course, students should be able to: 1) Enable the pupil to learn the concepts of mathematics and applications in his work. 2) To study the Definite Integrals, Properties of definite integrals. 3) To understand methods of integrations: Integration by parts, by Tabular, by Partial Fractions. 4) Study the applications of the definite integral: 1- Area under the curve, 2- Area between two curves, 3-Area in polar co-ordinate. 5) To understand the Numerical methods for evaluating definite integrals: I- Trapezoidal rule, II- Simpson's rule. 6) Study the Sequences: convergent sequence: Limits that arise frequently. 7) Study the infinite series: converges series, diverges series, Kind of series: 1-Geometric Series, P-Series. 8) To knows the Tests for converges of series:1-Integral Test, 2-Ratio Test, 3-RootTest, Taylor and Maclaurin series.

Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1) Describe the characteristics and Properties of definite integrals. 2) Describe and State the concept of methods of integrations: Integration by parts, by Tabular, by Partial Fractions. 3) To understands the applications of the definite integral: 1- Area under the curve, 2- Area between two curves, 3-Area in polar co-ordinate. 4) To knows the meaning of the Numerical methods for evaluating definite integrals: i) Trapezoidal rule, ii) Simpson's rule. 5) Describe the Sequences: convergent sequence: Limits that arise frequently. 6) Describe the Infinite series: converges series, diverges series, Kind of series: 1-Geometric Series, 2-P-Series. 7) Describe the Unit vector, vector equation, cross product, dot product. 8) To understands the Tests for converges of series: 1-Integral Test, 2-Ratio Test, 3-RootTest, To knows the meaning of Taylor and Maclaurin series.
Indicative Contents المحتويات الإرشادية	**Indicative content includes the following**. • Integration: Definite Integrals, Properties of definite integrals, Methods of integrations: Integration by parts, by Tabular, by Partial Fractions, Integration by reduction formulas, Integrating powers, Integration by Trigonometric Substitutions, Integration of irrational function, Integration of rational function of Trigonometric, Applications of the definite integral:1- Area under the curve, 2- Area between two curves, 3-Area in polar co-ordinate. [20 hr] • 4-Volumes By Disks: i) around $x-axis$, ii) around $y-axis$, 5- Volumes By Washers: i) around $x-axis$, ii) around $y-axis$, 6- Volumes By Cylindrical Shells: i) about $x-axis$, ii) about $y-axis$, Volume in polar co-ordinates system, Length of a plane curve, Area of a surface of revolution, Area of the surface in polar co-ordinates system. [20 hr] • Area of a surface of revolution, Area of the surface in polar co-ordinates system, Multiple Integrals: Double Integrals, Triple Integrals, Numerical methods for evaluating definite integrals: i) Trapezoidal rule, ii) Simpson's rule, Sequences: convergent sequence: Limits that arise frequently, Infinite series: converges series, diverges series, Kind of series:1-Geometric Series, P-Series, Tests for converges of series:1-Integral Test, 2-Ratio Test, 3-RootTest, Taylor and Maclaurin series. [20 hr]

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	64	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	86	**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	20% (20)	5 and 10	LO #1, #2 and #10, #11
	Assignments	2	10% (10)	2 and 12	LO #3, #4 and #6, #7,#8
	Projects.				
	Report	1	10% (10)		
Summative assessment	Midterm Exam	2hr	10% (10)	7	LO #1 - #7
	Final Exam	3hr	50% (50)	16	All
Total assessment			100%		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Integration: Definite Integrals, Properties of definite integrals.
Week 2	Methods of integrations.
Week 3	Methods of integrations.
Week 4	Methods of integrations.
Week 5	Applications of the definite integral.
Week 6	Volumes By Disks.
Week 7	Volumes By Washers. (mid-term Exam)
Week 8	Volumes By Cylindrical Shells.
Week 9	Volume in polar co-ordinates system, Length of a plane curve.
Week 10	Area of a surface of revolution, and in polar co-ordinates system.
Week 11	Multiple Integrals.
Week 12	Numerical methods for evaluating definite integrals.
Week 13	Sequences.
Week 14	Infinite series.
Week 15	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	George B. Thomas Jr, Weir Joel R. Hass 'Calculus' (V.12), 2014.	Yes
Recommended Texts	1. Haward Anton" Calculus and analytic geometry". 2. Schoms series "Theory and problems of calculus" .	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 Information معلومات المادة الدراسية					
Module Title	**Manufacturing Processes & Engineering Workshop**			**Module Delivery**	
Module Type	**S**			☒ **Theory** ☐ **Lecture** ☐ **Lab** ☐ **Tutorial** ☒ **Practical** ☐ **Seminar**	
Module Code	UOBAB0301024				
ECTS Credits	**4**				
SWL (hr/sem)	**100**				
Module Level	UGI		**Semester of Delivery**	Two	
Administering Department	Type Dept. Code		**College**	Type College Code	
Module Leader	Ahmed Saad Jasim		**e-mail**	ahmed.saad.jas@uobabylon.edu.iq	
Module Leader's Acad. Title	Assist. Lecture		**Module Leader's Qualification**	MSC	
Module Tutor	None		**e-mail**	E-mail	
Peer Reviewer Name	None		**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 Objectives أهداف المادة الدراسية	1) To study the machining operations and machine tools that include: turning and related operations, drilling and related operations, milling, grinding and other abrasive processes, and other machining operations. 2) To understand the bulk deformation processes in metal working that include: rolling and related operations, forging and related operations, extrusion, and wire and bar drawing and also study the sheet metal working / cutting operations, bending operations, and drawing. 3) Study the joining and assembly processes that include: fundamentals of welding, arc welding, resistance welding, oxyfuel gas welding, soldering, and brazing. 4) To learn the fundamentals of metal casting, and metal casting processes.

Module Learning Outcomes مخرجات التعلم للمادة الدراسية	**1.** Describe turning and related operations **2.** Learn drilling and related operations **3.** Give information about milling **4.** Define grinding and other abrasive processes **5.** Give information about other machining operations: shaping and planning, broaching, and sawing **6.** Know the rolling and related operations **7.** Learn about of forging and related operations **8.** Give information about extrusion **9.** Study wire and bar drawing **10.** Give information about sheet metal working / cutting operations, bending operations, and drawing **11.** Define fundamentals of welding **12.** Know the arc welding **13.** Define resistance welding, and ox fuel gas welding **14.** Study soldering, and brazing **15.** Give information about fundamentals of metal casting, metal casting processes.
Indicative Contents المحتويات الإرشادية	**Indicative content includes the following**. • Study the machining operations and machine tools that include: turning and related operations, drilling and related operations, milling, grinding and other abrasive processes, and other machining operations. [20 hr]. • Study the bulk deformation processes in metal working that include: rolling and related operations, forging and related operations, extrusion, and wire and bar drawing and also study the sheet metal working / (1) cutting operations, (2) bending operations, (3) drawing. [20 hr] • Study the joining and assembly processes that include: fundamentals of welding, arc welding, resistance welding, oxyfuel gas welding, soldering, and brazing. [16 hr] • study the fundamentals of metal casting, and metal casting processes. [4 hr]

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Teaching and learning strategies can include a range of whole class, group and individual activities to accommodate different abilities, skills, learning rates and styles that allow every student to participate and to achieve some degree of success. After considering students' needs, learning styles.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	64	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	36	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	2
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	3	15% (15)	5, 10, and14	LO #1- #4, #5 - #9 and #10 - #13
	Assignments	2	10% (10)	6 and 11	LO #1 - #5 and #6 - #10
	Report	1	5% (5)	13	All
	Practical	1	10% (10)	Continuous	All
Summative assessment	Midterm Exam	2hr	10% (10)	11	LO #1 - #10
	Final Exam	3hr	50% (50)	16	All
Total assessment			100%		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Turning and Related Operations
Week 2	Drilling and Related Operations
Week 3	Milling
Week 4	Grinding and Other Abrasive Processes
Week 5	Other Machining Operations: (1) shaping and planning, (2) broaching, and (3) sawing
Week 6	Rolling and Related Operations
Week 7	Forging and Related Operations
Week 8	Extrusion, Wire and Bar Drawing
Week 9	Wire and Bar Drawing
Week 10	Sheet Metal Working / (1) Cutting Operations, (2) Bending Operations, (3) Drawing
Week 11	Fundamentals of Welding – (mid-term Exam)
Week 12	Arc welding
Week 13	Resistance welding, Oxyfuel gas welding
Week 14	Soldering, Brazing
Week 15	Fundamentals of Metal Casting, Metal Casting Processes
Week 16	Preparatory week before the final Exam

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	A) The turning workshop consists of training its students on: 1) Listed work (adjusting the correct measurements for different diameters and lengths using a triangle turning pen).
Week 2	2) Make the arches (it should be on the same piece as the first exercise, after adjusting it and making sure of the measurements according to the drawing in the first exercise).
Week 3	3) Making different angles (introducing the student to the use of shaping pens (square pen, corner pen 55)).

Week 4	**Exam: A test was conducted for the student on what he learned in the theoretical and practical aspects**
Week 5	**B) The filling workshop consists of training its students on: 1) Filling flat surfaces and filling straight and inclined angles**
Week 6	**2) Sawing and sawing process**
Week 7	**3) Hand Drills and Vertical Stationary Drills (How to Operate and Use)**
Week 8	**Exam: A test was conducted for the student on what he learned in the theoretical and practical aspects**
Week 9	**C) The welding workshop consists of training its students on various welding methods, such as: 1) Manual arc welding: a) Training on how the electric arc works and occurs between two electrodes.**
Week 10	**b) Training on how to make welding lines straight.**
Week 11	**c) Training on how to weld the construction exercise (increasing the thickness of the piece).**
Week 12	**2) Gas welding (oxy-acetylene)**
Week 13	**3) Electric arc welding protected by inert gas represented by gases such as argon and carbon dioxide, where argon gas is used with tungsten electrode welding machines (T.I.G) and CO2 gas with machines (M.I.G).**
Week 14	**4) Electrical resistance welding, specifically spot welding.**
Week 15	**Exam: A test was conducted for the student on what he learned in the theoretical and practical aspects**
Week 16	**Preparatory week before the final Exam**

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	[1] Groover, Mikell P. ***Fundamentals of modern manufacturing: materials, processes, and systems***. John Wiley & Sons, 2020.	No
Recommended Texts	None	No
Websites	[1]https://books.google.com/books?hl=ar&lr=&id=mB7zDwAAQBAJ&oi=fnd&pg=PA1&dq=FUNDAMENTALS+OF+MODERN+MANUFACTURING+Materials,Processes,andSystems+Fourth+Edition&ots=H1hck34oBY&sig=os2Xrjr-16zwPs6JVbGDcG4fuy8	

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	**Chemistry**			**Module Delivery**	
Module Type	**S**			☒ **Theory** ☐ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	UOBAB0301025				
ECTS Credits	**4**				
SWL (hr/sem)	100				
Module Level		UGI	**Semester of Delivery**		Two
Administering Department		Type Dept. Code	**College**	Type College Code	
Module Leader	Ali Jassim Al-zuhairi		**e-mail**	met.ali.jassim@uobabylon.edu.iq	
Module Leader's Acad. Title		Assistant Professor	**Module Leader's Qualification**		Ph.D.
Module Tutor			**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 Objectives أهداف المادة الدراسية	1) To develop problem solving skills and understanding of the quantitative analytical methods. 2) To understand acids, basis and salts. 3) This course deals with the basic concept of buffers. 4) This is the basic subject for all physical chemistry concepts. 5) To understand ideal gas law. 6) To perform the thermochemistry.

Module Learning Outcomes مخرجات التعلم للمادة الدراسية	10. The students will know the principle of analytical chemistry. 11. List the quantitative and qualitative analysis. 12. Summarize what is meant by acids, basis and salts. 13. Discuss the titration curves. 14. Describe the principle of organic chemistry in terms of alkan, alkenes and alkynes. 15. Identify the basic hydrocarbons by its nomenclature and reactions. 16. Explain the Ideal gas law. 17. Identify the enthalpy of a chemical reaction.
Indicative Contents المحتويات الإرشادية	**Indicative content includes the following**. • Introduction of Analytical Chemistry and its types, The principle of Volumetric analysis, Moler, Normal and formal concentration, Acid Base titrations, Buffers and Titration Curves, Oxidation-Reduction reactions, Precipitation reactions. [20 hrs] • Organic chemistry (Introduction), The Alkanes, Alkanes reactions and Alkenes. [15 hrs] • Alkenes reactions, Alkynes and Alkynes reactions. [15 hrs] • Ideal gas low, Boyle's law, Charles's law, thermochemistry, Energy sources. [10 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	٦٤	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	٤
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	٣٦	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	2
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 and 10	LO #1, #2 and #10, #11
	Assignments	2	10% (10)	2 and 12	LO #3, #4 and #6, #7
	Projects / Lab.	1	10% (10)	Continuous	All
	Report	1	10% (10)	13	LO #5, #8 and #10
Summative assessment	**Midterm Exam**	١hr	10% (10)	7	LO #1 - #7
	Final Exam	3hr	50% (50)	16	All
Total assessment			100%		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Introduction - Analytical Chemistry and its types
Week 2	The principle of Volumetric analysis
Week 3	Moler, Normal and formal concentration
Week 4	Acid Base titrations
Week 5	Buffers
Week 6	Review of Titration Curves
Week 7	Mid-term Exam
Week 8	Oxidation-Reduction reactions
Week 9	Alkanes reactions
Week 10	Alkenes reactions
Week 11	Alkynes reactions
Week 12	Aldehydes and aketons
Week 13	Carboxylic acids reactions
Week 14	Ideal gas low and Boyle's law
Week 15	Thermochemistry and Energy sources
Week 16	**Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: Acid- Base titration
Week 2	Lab 2: Reduction - Oxidation titration
Week 3	Lab 3: Precipitation titration
Week 4	Lab 4: Complex metric titration
Week 5	Lab 5: Determination the density of a liquid
Week 6	Lab 6: Determination of Calorimetric Constant
Week 7	Lab 7: Determination the Viscosity of a pure liquid

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	General Chemistry ;Darrell D. Ebbing; Steven D. Gammon	no
Recommended Texts		
Websites	https://books.google.iq/books?id=BnccCgAAQBAJ&printsec=frontcover&redir_esc=y#v=onepage&q&f=false	

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	**English language I**			**Module Delivery**	
Module Type	**B**			☒ **Theory** ☐ **Lecture** ☐ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	UOBAB0301026				
ECTS Credits	٤				
SWL (hr/sem)	١٠٠				
Module Level	UGI		**Semester of Delivery**	Two	
Administering Department	Type Dept. Code		**College**	Type College Code	
Module Leader	Rusul Dawood Salman		**e-mail**	met.rusul.dawood@uobabylon.edu.iq	
Module Leader's Acad. Title	Lecturer		**Module Leader's Qualification**	MSc	
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 Objectives أهداف المادة الدراسية	1) Developing skills of reading, writing, speaking and listening. 2) Providing a survey of theoretical perspectives concerning the student's learning and development. 3) Providing an overview of a variety of important issues in English language that help the students to communicate easily with others. 4) Applying the theoretical issues in order to give the student the opportunity to practice language and encourage him to speak with foreign people. 5) Giving the students the ability to express their opinions and participating in discussion. 6) Using variety of digital devices and tools in order to interpret and create meaning.

Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. The ability to understand the uses of language in the light of purposes. 2. Identifying the most important daily phrases to be applicable in life. 3. Development of evidence-based arguments. 4. Making the students aware of the correct usages of English grammar in writing and speaking. 5. Improving the students' ability in English in terms of fluency and comprehensibility. 6. Students will give oral presentation and receive feedback on their performance. 7. Improving the students' reading skills through the extensive reading. 8. Providing the students with a large repertoire of vocabulary. 9. Applying the grammatical forms in communicative contexts such as: class activities, reading & writing, and homework. 10. Strengthening the students' ability to write essays and academic papers. 11. Enhancing the students' competence in four important elements: Writing. speaking, reading and listening.
Indicative Contents المحتويات الإرشادية	**Indicative content includes the following**. • Focusing on four important issues in English language: Writing, speaking reading and listening [15 hrs] • Understanding the general topic or main idea, major points, important facts and details, vocabulary in context, and pronoun references. [15 hrs] • Comprehending the main idea, major points, and important details related to the main idea. [10 hrs] • Students should be able to speak successfully in and outside the classroom. [15 hrs] • [6 hrs] <u>Part B - Analogue Electronics</u> Fundamentals • Recognizing tenses choosing the correct form, arranging the sentences in the correct order, [15 hrs] • Covering aspects such as phonetics, semantics and pragmatics. [7 hrs] • Exploring the building blocks of the language, understanding language in deeper level, learning how to structure words and sentences so that other people can understand them. [15 hrs]

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Student is an essential part of the process thus we should take into consideration the levels of student's' comprehension whence providing him with better and easies planning, improved ability to monitor student's goals ,teaching language skills across all curriculum topics, Speaking slowly and allowing extra time for students to respond, using a variety of methods to engage learning,.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ أسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	٣٣	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	٢
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	٦٧	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	٤
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	١٠٠		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	3	20% (20)	5 and 13	LO #1, #2 and #10, #11
	Assignments	2	10% (10)	2 and 12	LO #3, #4 and #6, #7
	Projects / Lab.				
	Report	1	10% (10)	13	LO #5, #8 and #10
Summative assessment	**Midterm Exam**	١hr	10% (10)	7	LO #1 - #7
	Final Exam	٣hr	50% (50)	16	All
Total assessment			100%		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Introduction – Giving a general information about English Language
Week 2	Speaking (paired choice) asking about the general opinions about possible issues
Week 3	Speaking(campus announcement & general conversation) report on the speaker's opinion & explain why he/she feels that way
Week 4	Integrated speaking (Academic reading & Lecture) explaining the academic topics & describing the main points in it.
Week 5	Listening to engineering conversation to obtain a wide vocabularies
Week 6	Listening to various videos concerning the engineering fields as: (Mechanical engineering, electrical engineering in addition to renewable energies).
Week 7	**Mid-term Exam**
Week 8	Writing (learning students how to write essays on engineering field)
Week 9	Writing (enabling students to write their opinion about specific academic topic in general or write about engineering subject in particular).
Week 10	Speaking (making the students sum up the main points of the lecture that is delivered previously)
Week 11	Speaking (increasing the student' ability to speak fluency and increasing its rate)
Week 12	Listening (encourage the student to make inferences from what he/she heard before)
Week 13	Listening (ask the student what the speaker imply in his/her speech)
Week 14	Writing (ask student to write the essential information in the highlighted sentences in paragraph and make paraphrasing in to those sentences)
Week 15	Witting (encourage student to extract the most important issues in paragraph)
Week 16	**Preparatory week before the final Exam**

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	TOEFL Practice Online The official practice test that can help you go anywhere	No
Recommended Texts	The Cambridge Encyclopedia of the English Language By David Crystal	No
Websites	https://www.cambridge.org./	

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.

UGII – level
Semester – Three

Module Information معلومات المادة الدراسية					
Module Title	**Thermodynamics I**			**Module Delivery**	
Module Type	**S**			☒ **Theory** ☐ **Lecture** ☒ **Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	UOBAB0301031				
ECTS Credits	**6**				
SWL (hr/sem)	١٥٠				
Module Level	UGII		**Semester of Delivery**	Three	
Administering Department	Type Dept. Code		**College**	Type College Code	
Module Leader	Ali Jaber Abdulhamed		**e-mail**	msb.ali.jaber@uobabylon.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 Objectives أهداف المادة الدراسية	1) To develop problem solving skills and understanding of pure substance. 2) To understand behavior of Ideal gases. 3) To develop problem solving skills and understanding of IC engine cycles. 4) To develop problem solving skills and understanding of heat, work and the relation between it. 5) To develop problem solving skills and understanding of 1st law of thermodynamics. 6) To develop problem solving skills and understanding of 1st law on closed system. 7) To develop problem solving skills and understanding of 1st law on open system.

Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Know how to use the thermodynamic tables. 2. Recognize how pure substance works in system. 3. Recognize between pure substance and ideal gases. 4. Recognize between air standard Otto, Diesel, and Dual cycles. 5. Know the relations between heat and work. 6. Know the energies as Kinetic, potential, enthalpy and internal energy. 7. Know the 1st law of thermodynamics. 8. Recognize between open and close systems.
Indicative Contents المحتويات الإرشادية	**Indicative content includes the following**. • Introduction, Definition, Force, pressure, Energy, resources, Heat, work, power, Internal energy, enthalpy, 0^{th} law, Temperature, and its measurement, thermodynamics properties, liquid-vapor relations. **[20 hrs]** • Ideal gases, efficiency analysis for IC engines. **[15 hrs]** • First law of thermodynamics/perpetual motion machine; Equation of state, closed-system processes, constant volume pressure and processes, open -system processes. **[20 hrs]** • Adiabatic and polytrophic processes; Open -system processes, steady- flow energy equation. **[20 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 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	79	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	5
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	71	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	5
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	١٥٠		

Module Evaluation
تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	2	10% (20)	5 and 10	LO #1 - #7
	Projects / Lab.	1	10% (10)	Continuous	All
	Report	1	10% (10)	11	LO #3, #5 and #7
Summative assessment	**Midterm Exam**	2hr	10% (10)	9	LO #1 - #4
	Final Exam	٣hr	50% (50)	16	All
Total assessment			100%		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Some Concept and Definitions
Week 2	Properties of Pure Substances
Week 3	Thermodynamics Tables
Week 4	Ideal Gases
Week 5	Air-standard Otto Cycle
Week 6	Air-standard Diesel Cycle
Week 7	The Work Type (W)
Week 8	Thermodynamic work
Week 9	Mid-term Exam
Week 10	Heat Transfer in Control mass system
Week 11	The 1st Law of Thermodynamic - Heat Transfer, enthalpy, and internal Energy
Week 12	Close system processes
Week 13	Open system processes
Week 14	The 1st Law of Thermodynamic in Turbine, Compressor, Boiler, Condenser
Week 15	The 1st Law of Thermodynamic in, pipe, Duct, valves, Mixing Chamber
Week 16	**Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: Calculate the dryness fraction for wet steam
Week 2	Lab 2: Find the pressure curve for steam
Week 3	Lab 3: Verification of Boyle's law.
Week 4	Lab 4: Verification of Charles's law
Week 5	Lab Exam

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Fundamental of Classical Thermodynamics / Van Wylen	Yes
Recommended Texts	Thermodynamics: an Engineering Approach / Yunus Cengel	Yes
Websites	https://scholar.google.com/scholar?hl=en&as_sdt=0%2C5&q=Thermodynamics%3A+an+Engineering+Approach&btnG=	

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	**Fluid Mechanics I**			**Module Delivery**	
Module Type	**S**			☒ **Theory** ☐ **Lecture** ☒ **Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	UOBAB0301032				
ECTS Credits	**6**				
SWL (hr/sem)	**150**				
Module Level	UGII		**Semester of Delivery**	Three	
Administering Department	Type Dept. Code		**College**	Type College Code	
Module Leader	Sanaa Abdulrazaq Jassim		**e-mail**	met.sanaa.abd@uobabylon.edu.iq	
Module Leader's Acad. Title	Assist. Professor		**Module Leader's Qualification**	PHD	
Module Tutor			**e-mail**		
Peer Reviewer Name	None		**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 Objectives أهداف المادة الدراسية	1) To study the fluid mechanics science. and why study fluid mechanics. and to understand fluid properties. 2) To learn fluid properties. 3) Study the fluid in static condition, pressure of fluid, pressure units and gages. 4) Study the forces acting on bodies immersing and floating in fluids, stability and relative equilibrium of them. 5) To understand testing of fluids, viscosity, type of pressure gauges, hydrostatic pressure measurement, stability of body floating in liquid, proving Bernoulli's equation. 6) To learn fluid in dynamic equations.

Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. To understand Fluid properties, Newton's law of Viscosity, Kinematic viscosity Bulk Modulus of elasticity, and Surface tension. Describe basic definition and conception of Fluid Statics, Pressure at a point, - Variation of Pressure in a static fluid. 2. Approve Hydrostatic laws, and learn about units and scales of Pressure measurement, and types of Manometers. 3. Calculate Force on plane and curved surfaces. 4. Define buoyant force, and describe Stability of floating and submerged bodies. 5. Understand relative equilibrium (linear acceleration), and relative equilibrium (uniform rotation) 6. Define Fluid flow concepts and Basic Equations. 7. Continuity equation. 8. Euler's equation of motion along streamline. 9. Bernoulli equation. 10. With regard to the practical side, the program aims to familiarize students with experiments related to viscosity measurement and identification of pressure measuring devices in addition to measuring hydrostatic pressure and equilibrium of floating and submerged bodies in fluids.
Indicative Contents المحتويات الإرشادية	**Indicative content includes the following**. • Introduction of fluid mechanic science, and why study fluid mechanics, and to understand fluid properties. Also to learn static fluid mechanics. [15 hrs]. • Study the Pressure at a point,- Variation of Pressure in a static fluid . Hydrostatic laws, units and scales of Pressure measurement, and types of Manometers. [15 hrs] • Calculate Force on plane and curved surfaces. Buoyant force, and Stability of floating and submerged bodies .Understand relative equilibrium (linear acceleration), and relative equilibrium (uniform rotation). [25 hrs]. • Define Fluid flow concepts and Basic Equations. Continuity equation. Euler's equation of motion along streamline. Bernoulli equation. [20 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	79	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	5
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	71	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	4
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 and 10	LO #1, #2 and #10, #11
	Assignments	2	10% (10)	2 and 12	LO #3, #4 and #6, #7
	Projects / Lab.	1	10% (10)	Continuous	All
	Report	1	10% (10)	13	LO #5, #8 and #10
Summative assessment	Midterm Exam	2hr	10% (10)	7	LO #1 - #7
	Final Exam	3hr	50% (50)	16	All
Total assessment			100%		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Fluid properties , General definitions, - Newton's law of Viscosity, - Kinematic viscosity
Week 2	Bulk Modulus of elasticity, Surface tension
Week 3	Fluid Statics, Definitions, Pressure at a point, - Variation of Pressure in a static fluid
Week 4	Hydrostatic laws, Units and scales of Pressure measurement
Week 5	Manometers (Pressure Measurement)
Week 6	Force on plane surfaces
Week 7	Force on curved surfaces – (Mid-term Exam)
Week 8	Buoyant force
Week 9	Stability of floating and submerged bodies
Week 10	Relative equilibrium (linear acceleration)
Week 11	Relative equilibrium (uniform rotation)
Week 12	Fluid flow concepts and Basic Equations, Definitions
Week 13	Continuity equation
Week 14	Euler's equation of motion along streamline
Week 15	Bernoulli equation
Week 16	**Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	None
Week 2	Experiment 1: Measurement of viscosity
Weeks 3-4	None
Week 5	Experiment 2: identifying pressure gauges and manometers
Week 6	Experiment 3: Hydrostatic pressure
Weeks 7-9	None
Week 10	Experiment 4: Metacentric height

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Frank M. White, Fluid Mechanic, fifth edt.,	Yes
Recommended Texts	1- ATextbook of Fluid Mechanics And Hydraulic Machines. Ninth edt. 2010 2- FLUID MECHANICS FOR ENGINEERS , 2011	No
Websites	https://www.infobooks.org/free-pdf-books/engineering/fluid-mechanics/ https://www.academia.edu/20207960/Fluid_Mechanics_Textbook	

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**			**Module Delivery**	
Module Type	**S**			☒ **Theory** ☐ **Lecture** ☐ **Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	UOBAB0301033				
ECTS Credits	**6**				
SWL (hr/sem)	**150**				
Module Level	UGII		**Semester of Delivery**	Three	
Administering Department			**College**		
Module Leader	Ahmed Mohammed Merza		**e-mail**	ahmed.hatrush@uobabylon.edu.iq	
Module Leader's Acad. Title	Assist. Lecture		**Module Leader's Qualification**	MSC	
Module Tutor			**e-mail**		
Peer Reviewer Name	None		**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	Mathematics	**Semester**	1
Co-requisites module	Applied Mathematics	**Semester**	2

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	1. Understanding the basic concepts of calculus, differential equations, and linear algebra. 2. Applying mathematical principles to solve engineering problems. 3. Developing skills in mathematical modeling and simulation. 4. Understanding the role of mathematics in engineering design and analysis. 5. Developing critical thinking and problem-solving skills. 6. Developing effective communication skills in mathematics. 7. Understanding the importance of mathematical accuracy and precision in engineering.

Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Understanding the concept of vectors and their representation in two and three dimensions. 2. Being able to perform vector operations such as addition, subtraction, scalar multiplication, dot product, and cross product. 3. Understanding the concept of periodic functions and their representation using Fourier series. 4. Learning the techniques to calculate Fourier coefficients and Fourier series. 5. Applying Fourier series to solve problems in signal processing, heat transfer, and wave propagation. 6. Understanding the concept of Fourier transform and its applications. 7. Understanding the properties of Fourier transform, such as linearity, time shifting, and frequency shifting 8. Understand the basic concepts and terminology of differential equations. 9. Solve first-order differential equations using various techniques such as separation of variables, integrating factors, and exact equations. 10. Solve second-order differential equations with constant coefficients using various techniques such as characteristic equations and undetermined coefficients. 11. Solve higher-order differential equations and systems of differential equations. 12. Understanding the concept of Laplace transform and its application in solving differential equations. 13. Ability to transform time-domain signals into frequency-domain signals using Laplace transform. 14. Understanding the properties of Laplace transform, such as linearity, time shifting, differentiation, integration, convolution, and initial and final value theorems. 15. Understanding the concepts of sequences and series, including arithmetic and geometric sequences, and the sum of a finite and infinite series. 16. Solving problems involving sequences and series, such as finding the nth term, the sum of the first n terms, and the limit of a sequence.
Indicative Contents المحتويات الإرشادية	**Indicative content includes the following**. • Circles, parabola, ellipse, hyperbola, rotation, hyperbolic functions, inverse hyperbolic functions. Polar coordinate and parametric equations. Equations of lines and planes, product of three or more vectors, vector function and motion: velocity and acceleration, tangential vectors, curvature and normal vector. [8 hrs] • **Fourier series:** Periodic functions, Fourier series, Euler formulas, even and odd functions (Half–Range expansions), applications in electrical engineering. **Fourier Transform:** Complex exponential form, Fourier Integral, Fourier transforms and inverse, Properties, convolution theorem, power spectral density and convolution signals and linear system applications. [16 hrs] • **Partial Differentiation:** Function of two or more variables, partial derivatives, directional derivative, gradient, divergence, curl, tangent plane and normal line,

	maxima, minima, saddle point. **Ordinary Differential Equations:** First order (variables separable, homogeneous, linear – Bernoulli and exact, second order (homogeneous and non-homogeneous), higher order differential equations. [20 hrs] • **Laplace Transform:** Unit step function, Gamma function, definition of Laplace transform, properties, inverse of Laplace transform, properties, partial fractions, convolution theorem, integral equation, solution of differential equations using Laplace transform, applications.[12 hrs] • **Sequences and Series:** Sequences (convergence, test of monotone), series (geometric series, nth partial sum, test of convergence, alternating series), power and Taylor's series. [4 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	64	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	86	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	2
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 and 10	LO #1, #2 and #10, #11
	Assignments	2	10% (10)	3 and 12	LO #3, #4 and #6, #7
	Projects	1	10% (10)	Continuous	All
	Report	1	10% (10)	13	LO #5, #8 and #10
Summative assessment	**Midterm Exam**	2hr	10% (10)	7	LO #1 - #7
	Final Exam	3hr	50% (50)	16	All
Total assessment			100%		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Circles, parabola, ellipse, hyperbola, rotation, hyperbolic functions, inverse hyperbolic functions. Polar coordinate and parametric equations.
Week 2	**Vector Analysis**: Equations of lines and planes, product of three or more vectors, vector function and motion: velocity and acceleration, tangential vectors, curvature and normal vector**.**
Week3&4	**Fourier series:** Periodic functions, Fourier series, Euler formulas, even and odd functions (Half–Range expansions), applications in electrical engineering.
Week 5&6	**Fourier Transform:** Complex exponential form, Fourier Integral, Fourier transforms and inverse, Properties, convolution theorem, power spectral density and convolution signals and linear system applications.
Week 7&8	**Partial Differentiation:** Function of two or more variables, partial derivatives, directional derivative, gradient, divergence, curl, tangent plane and normal line, maxima, minima, saddle point.
Week 9 & 10& 11	**Ordinary Differential Equations:** First order (variables separable, homogeneous, linear – Bernoulli and exact, second order (homogeneous and non-homogeneous), higher order differential equations
Week 12 &13&14	**Laplace Transform:** Unit step function, Gamma function, definition of Laplace transform, properties, inverse of Laplace transform, properties, partial fractions, convolution theorem, integral equation, solution of differential equations using Laplace transform, applications.
Week 15	**Sequences and Series:** Sequences (convergence, test of monotone), series (geometric series, nth partial sum, test of convergence, alternating series), power and Taylor's 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 (Muhadharaty)***	No
Recommended Texts	Engineering-mathematics-ii-2009-cuppy	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 Information معلومات المادة الدراسية					
Module Title	**Electronic Circuits**			**Module Delivery**	
Module Type	**S**			☒ **Theory** ☐ **Lecture** ☐ **Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	UOBAB0301034				
ECTS Credits	**4**				
SWL (hr/sem)	**100**				
Module Level	UGII		**Semester of Delivery**	Three	
Administering Department			**College**		
Module Leader	Ahmed Mohammed Merza		**e-mail**	**ahmed.hatrush@uobabylon.edu.iq**	
Module Leader's Acad. Title	Assist. Lec		**Module Leader's Qualification**	MSC	
Module Tutor			**e-mail**		
Peer Reviewer Name	None		**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 Circuits	**Semester**	One
Co-requisites module		**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	1. Understand conduction using electron and hole theory. 2. Develop a clear understanding of the basic operation and characteristics of a diode in the no-bias, forward-bias, and reverse-bias regions. 3. Be able to describe the difference between *n* - and *p* -type materials. 4. Understand the concept of load-line analysis and how it is applied to diode networks. 5. Become familiar with the use of equivalent circuits to analyze series, parallel, and series-parallel diode networks. 6. Understand the process of rectification to establish a dc level from a sinusoidal ac input. 7. Become familiar with the basic construction and operation of the Bipolar Junction Transistor. 8. Be able to determine the dc levels for the variety of important BJT configurations.

	9. Become familiar with the construction and operating characteristics of Junction Field Effect (JFET), Metal-Oxide Semiconductor FET (MOSFET), and Metal-Semiconductor FET (MESFET) transistors. 10. Be able to perform a dc analysis of JFET, MOSFET, and MESFET networks. 11. Become acquainted with the small-signal ac model for a JFET and MOSFET.

Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Understanding of the basic principles and concepts of electronic circuits. 2. Ability to design and analyze electronic circuits using various electronic components. 3. Ability to troubleshoot electronic circuits and identify faults. 4. Knowledge of different types of electronic circuits, such as analog and digital circuits, and their applications. 5. Knowledge of different types of electronic devices, such as transistors, diodes, and operational amplifiers, and their applications in electronic circuits. 6. Understanding of safety measures while working with electronic circuits. 7. Ability to apply the knowledge and skills learned in electronic circuits to create various electronic systems. 8. Development of critical thinking and problem-solving skills. 9. Preparation for pursuing a career in electronics engineering or related fields.
Indicative Contents المحتويات الإرشادية	**Indicative content includes the following**. **Semiconductor diode:** Introduction, semiconductor materials: Ge, Si, AND GaAs, covalent bonding and intrinsic materials, energy levels, n -type and p -type materials, semiconductor diode, diode equivalent circuits, reverse recovery time, diode testing, Zener diodes, light-emitting diodes, **Diode Applications:** introduction, load-line analysis, series diode configurations, parallel and series–parallel configurations, and/or gates, sinusoidal inputs; half-wave rectification, full-wave rectification, clippers, clampers, Zener diodes, voltage-multiplier circuits. [8 hrs] **Bipolar Junction Transistors:** introduction**,** transistor construction, transistor operation, Common-Base Configuration, Common-Emitter Configuration, Common-Collector Configuration, Limits of Operation, Transistor Specification Sheet, Transistor Testing, **DC Biasing—BJTs**: Fixed-Bias Configuration, Emitter-Bias Configuration, Voltage-Divider Bias Configuration, Collector Feedback Configuration, Emitter-Follower Configuration, Common-Base Configuration. [8 hrs] **Field-Effect Transistors**: Construction and Characteristics of JFETs, Transfer Characteristics, Important Relationships, Depletion-Type MOSFET, Enhancement-Type MOSFET, **FET Biasing:** Introduction, Fixed-Bias Configuration, Self-Bias Configuration, Voltage-Divider Biasing, Common-Gate Configuration, Depletion-Type MOSFETs, Enhancement-Type MOSFETs. [6 hrs] **FET Amplifiers:** FET Amplifiers, Introduction, JFET Small-Signal Model, Fixed-Bias Configuration, Self-Bias Configuration, Voltage-Divider Configuration, Common-Gate Configuration, Source-Follower (Common-Drain) Configuration, Depletion-Type MOSFETs, Enhancement-Type MOSFETs, MOSFET Drain-Feedback Configuration, E-MOSFET Voltage-

	Divider Configuration, Designing FET Amplifier Networks, Operational Amplifier: Introduction, Differential Amplifier Circuit, Op-Amp Basics, Practical Op-Amp Circuits. [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 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	64	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	36	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	2
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 and 10	LO #1, #2 and #10, #11
	Assignments	2	10% (10)	3 and 12	LO #3, #4 and #6, #7
	Projects	1	10% (10)	Continuous	All
	Report	1	10% (10)	13	LO #5, #8 and #10
Summative assessment	**Midterm Exam**	2hr	10% (10)	7	LO #1 - #7
	Final Exam	3hr	50% (50)	16	All
Total assessment			100%		

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

Week	Material Covered
Week 1&2	**Semiconductor diode:** Introduction, semiconductor materials: Ge, Si, AND GaAs, covalent bonding and intrinsic materials, energy levels, n -type and p -type materials, semiconductor diode, diode equivalent circuits, reverse recovery time, diode testing, Zener diodes, light-emitting diodes
Week 3&4	**Diode Applications:** introduction, load-line analysis, series diode configurations, parallel and series–parallel configurations, and/or gates, sinusoidal inputs; half-wave rectification, full-wave rectification, clippers, clampers, Zener diodes, voltage-multiplier circuits.

Week5&6	**Bipolar Junction Transistors:** introduction**,** transistor construction, transistor operation, Common-Base Configuration, Common-Emitter Configuration, Common-Collector Configuration, Limits of Operation, Transistor Specification Sheet, Transistor Testing.
Week 7&8	**DC Biasing—BJTs**: Fixed-Bias Configuration, Emitter-Bias Configuration, Voltage-Divider Bias Configuration, Collector Feedback Configuration, Emitter-Follower Configuration, Common-Base Configuration.
Week 9	**Field-Effect Transistors**: Construction and Characteristics of JFETs, Transfer Characteristics, Important Relationships, Depletion-Type MOSFET, Enhancement-Type MOSFET.
Week 10& 11	**FET Biasing:** Introduction, Fixed-Bias Configuration, Self-Bias Configuration, Voltage-Divider Biasing, Common-Gate Configuration, Depletion-Type MOSFETs, Enhancement-Type MOSFETs.
Week 12&13	**FET Amplifiers:** FET Amplifiers, Introduction, JFET Small-Signal Model, Fixed-Bias Configuration, Self-Bias Configuration, Voltage-Divider Configuration, Common-Gate Configuration, Source-Follower (Common-Drain) Configuration.
Week 14	Depletion-Type MOSFETs, Enhancement-Type MOSFETs, MOSFET Drain-Feedback Configuration, E-MOSFET Voltage-Divider Configuration, Designing FET Amplifier Networks.
Week 15	Operational Amplifier: Introduction, Differential Amplifier Circuit, Op-Amp Basics, Practical Op-Amp Circuits.
Week 16	**Preparatory week before the final Exam.**

Delivery Plan (Weekly Lab. Syllabus)
المنهاج الاسبوعي للمختبر

	Material Covered
Week 1	Diode characteristics
Week 2	half-wave rectification, full-wave rectification
Week 3&4	clippers, clampers, Zener diodes, voltage-multiplier circuits
Week 5	Bipolar Junction Transistors:, Common-Base Configuration, , Common-Collector Configuration.
Week 6	Common-Emitter Configuration, Transistor Testing.
Week 7	FET Biasing: Fixed-Bias Configuration, Self-Bias Configuration, ,
Week 8	FET Biasing: Voltage-Divider Biasing, Common-Gate Configuration
Week 9	Depletion-Type MOSFETs, Enhancement-Type MOSFETs.
Week 10&11	Operational Amplifier: Differential Amplifier Circuit, Op-Amp Basics,
Week 12 - 14	Practical Op-Amp Circuits.

Learning and Teaching Resources مصادر التعلم والتدريس

	Text	**Available in the Library?**
Required Texts	***Electronic Devices and Circuit Theory, Eleventh Edition Robert L. Boylestad and Louis Nashelsky***	No
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 Information معلومات المادة الدراسية					
Module Title	**English language II**			**Module Delivery**	
Module Type	**B**			☒ **Theory** ☐ **Lecture** ☐ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**UOBAB0301035**				
ECTS Credits	٤				
SWL (hr/sem)	١٠٠				
Module Level	UGII		**Semester of Delivery**	Three	
Administering Department	Type Dept. Code		**College**	Type College Code	
Module Leader	Rusul Dawood Salman		**e-mail**	met.rusul.dawood@uobabylon.edu.iq	
Module Leader's Acad. Title	Lecturer		**Module Leader's Qualification**	M.A.	
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 Objectives أهداف المادة الدراسية	1) Improving reading, writing, speaking, and listening abilities. 2) Presenting an overview of theoretical perspectives concerning the students' development and learning. 3) Giving the students a broad understanding of various crucial English language topics that facilitate easy communication with others. 4) Applying the theories into reality to allow the student to practice speaking with foreigners and to encourage him to do so. 5) Allowing students to participate in discussions and sharing their views. 6) Using a range of digital tools and devices to interpret and construct meaning.

Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1-understanding how language is used in relation to its objectives. 2. Selecting the most essential everyday expressions that can be used in daily interactions. 3. Developing the arguments based upon realities. 4. Teaching the students how to use English grammar properly in speaking and writing. 5. Increasing the students' proficiency and comprehension of the English language. 6. Students will do an oral presentation and get comments on how they did. 7. Increasing the students' reading proficiency through in-depth reading. 8. Giving the students access to a wide variety of words. 9. Using the grammatical forms in communicative contexts including homework, reading, and writing assignments. 10. Improving students ' abilities to write essay and academic paper in a skillful way. 11. Improving students' proficiency in four
Indicative Contents المحتويات الإرشادية	**Indicative content includes the following**. • Emphasizing the following four crucial English-language issues: speaking, reading, and listening; and [15 hrs] • comprehending the overall subject or main idea, major concepts, essential details, terminology used in context, and pronoun references. [15 hrs] • being able to understand the primary idea, important components, as well as essential information relevant to the main idea. [10 hrs] • Inside as well as outside of the classroom, students should be able to talk clearly. [15 hrs] Part B - Analogue Electronics Fundamentals • Learning tenses selecting the appropriate format, placing the sentences in the appropriate order, [15 hrs] • Covering aspects such as phonetics, semantics and pragmatics. [7 hrs] • Examining the language's grammatical foundations, developing a deeper knowledge of language, and learning how to organize words and sentences so that other people can understand them. [15 hrs]

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The student is a crucial component of the learning process, so we should consider his comprehension levels as the main concern by providing him with better and easier planning, improved ability to track student goals, teaching language skills across all curriculum topics, speaking slowly and giving students extra time to respond, and using a variety of methods to engage learning.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ أسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	٣٣	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	٢
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	٦٧	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	٤
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	١٠٠		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	3	20% (20)	5 and 13	LO #1, #2 and #10, #11
	Assignments	2	10% (10)	2 and 12	LO #3, #4 and #6, #7
	Projects / Lab.				
	Report	1	10% (10)	13	LO #5, #8 and #10
Summative assessment	Midterm Exam	١hr	10% (10)	7	LO #1 - #7
	Final Exam	٣hr	50% (50)	16	All
Total assessment			100%		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Introduction – Giving a general information about English Language
Week 2	Speaking in classroom the student respond to questions & participate in academic discussions with other students
Week 3	Speaking the student must synthesize and summarize what they have read in their textbooks and heard in class
Week 4	Speaking (outside classroom) participate in casual conversations& express their opinions
Week 5	Listening understand the relationships between ideas presented (for example, compare/contrast, cause/effect, or steps in a process)
Week 6	Listening to various videos concerning the engineering fields as: (Mechanical engineering , electrical engineering in addition to renewable energies).
Week 7	**Mid-term Exam**
Week 8	Reading each word and each sentence, practice skimming a passage quickly to get a general impression of the main idea.
Week 9	Reading (Choose some unfamiliar words in the passage and guess the meanings from the context (surrounding sentences).
Week 10	Speaking (communicate with people in such places as the bookstore, the library, and the housing office)
Week 11	Speaking (increasing the student' ability to speak fluency and increasing its rate)
Week 12	Listening for pragmatic understanding (recognize a speaker's attitude and degree of certainty)
Week 13	Listening make connections among pieces of information in a conversation or lecture
Week 14	Writing (Often students need to write a paper or an essay response on an exam about what they are learning in their classes. This requires combining information they have heard in class lectures with what they have read in textbooks or other materials).
Week 15	Witting (take notes on what they hear and read, and use them to organize information before writing / summarize, paraphrase, and cite information from the source material accurately / write about the ways the information they heard relates to the information they read)
Week 16	**Preparatory week before the final Exam**

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	TOEFL Practice Online The official practice test that can help you go anywhere	No
Recommended Texts	The Cambridge Encyclopedia of the English Language By David Crystal	No
Websites	https://www.cambridge.org./	

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
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	**Material Science**			**Module Delivery**	
Module Type	**S**			☒ **Theory** ☐ **Lecture** ☐ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	UOBAB0301036				
ECTS Credits	**4**				
SWL (hr/sem)	**100**				
Module Level	UGII		**Semester of Delivery**	Three	
Administering Department			**College**		
Module Leader	Maithem Hussein Rasheed		**e-mail**	met.maithem.hussiem@uobabylon.edu.iq	
Module Leader's Acad. Title	Assist .Professor		**Module Leader's Qualification**	M.SC	
Module Tutor			**e-mail**		
Peer Reviewer Name	None		**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 Objectives أهداف المادة الدراسية	1) To study the engineering materials science, and why study engineering materials, and to understand classifications of Engineering Materials. 2) To learn crystal and no crystal structures and unit cell. 3) Study the direction of crystallography and miller indices. 4) Study the atomic packing factors. , study the stress – strain curve , young 5) To understand testing of engineering materials, tension, compression, types of hardness methods. 6) to learn metallurgy engineering, phase equilibrium diagram , Fe- C diagram , heat treatments composite materials

Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Explain importance of materials in materials science and engineering field. 2. Relate between material and engineering. 3. Classify materials according to their types. 4. Describe basic definition and conception of materials and physical properties of materials. 5. Follow new developments in materials application field. 6. Information about atomic structure, atomic bonds, crystal structure, crystal geometry and crystal defects. 7. Define structure of atoms.. 8. Define space lattice, unit cell, crystal systems and Bravais lattice. 9. Calculate unit cells and volumetric, planar and linear density values in unit cell.. 10. Describe crystal imperfections. 11. Give information about mechanical properties of materials. 12. Stress- strain curve. 13. Study the different hardness methods experiments and calculations. 14. Give information about metal, polymer, ceramic and composite materials and their properties which used in automobile industry. 15. Study the metallurgy engineering, phase equilibrium diagram, Fe- C diagram, heat treatments. .
Indicative Contents المحتويات الإرشادية	**Indicative content includes the following.** • Introduction of engineering materials science, and why study engineering materials, and to understand classifications of Engineering Materials. Also to learn crystal and no crystal structures and unit cell, and study the direction of crystallography and miller indices. Study the atomic packing factors. [15 hr.] • study the stress – strain curve , young modulus .and to understand testing of engineering materials , tension , compression , types of hardness methods (brinell , Vickers , Rockwell). Average and standard deviation. [15 hr.] • Study the composite materials (matrix and reinforcement) , ceramics materials, metal, polymer, ceramic and composite materials and their properties which used in automobile industry . • Study the metallurgy engineering, phase equilibrium diagram, Fe- C diagram, heat treatments. [15 hr.]

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 اسبوع			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	33	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	67	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	4
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% (15)	5 and 10	LO #1, #2 and #10
	Assignments	2	10% (15)	2 and 10	LO #3, #4 and #6, #10
	Projects / Lab.				
	Report	1	10% (10)	13	LO #5, #8 and #14
Summative assessment	Midterm Exam	2hr	10% (10)	7	LO #1 - #7
	Final Exam	3hr	50% (50)	16	All
Total assessment			100%		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري

	Material Covered
Week 1	Introduction of material science
Week 2	Classifications of engineering material
Week 3	Crystal and non crystal structures
Week 4	Unit cell and atomic packing factor
Week 5	Direction of crystallography and millier indices
Week 6	Stress – strain curve , young modulus
Week 7	Mechanical properties of engineering material. (Mid-term Exam)
Week 8	Tension – compression tests.
Week 9	Hardness test , types of hardness methods.
Week 10	Composite materials
Week 11	Ceramic materials
Week 12	Non destructive tests
Week 13	Metallurgy ,metals and alloys
Week 14	phase equilibrium diagram , Fe-C phase diagram
Week 15	Heat treatments
Week 16	**Preparatory week before the final Exam**

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Materials Science and Engineering ,william callister, 2007	Yes
Recommended Texts	The science and engineering of materials, donald askeland 2005.	No
Websites	https://ftp.idu.ac.id/wp-content/uploads/ebook/tdg/TEKNOLOGI%20REKAYASA%20MATERIAL%20PERTAHANAN/Materials%20Science%20and%20Engineering%20An%20Introduction%20by%20William%20D.%20Callister,%20Jr.,%20David%20G.%20Rethwish%20(z-lib.org).pdf	

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.

UGII – level
Semester – Four

Module Information معلومات المادة الدراسية					
Module Title	**Thermodynamics II**			**Module Delivery**	
Module Type	**S**			☒ **Theory** ☐ **Lecture** ☒ **Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	UOBAB0301041				
ECTS Credits	**6**				
SWL (hr/sem)	١٥٠				
Module Level	UGII		**Semester of Delivery**	Four	
Administering Department	Type Dept. Code		**College**	Type College Code	
Module Leader	Ali Jaber Abdulhamed		**e-mail**	msb.ali.jaber@uobabylon.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 Objectives أهداف المادة الدراسية	1. To develop problem solving skills and understanding of Entropy. 2. To understand of 2nd law of thermodynamics. 3. To understand exergy. 4. To develop problem solving skills and understanding of Isentropic Efficiency of Turbine, nozzle, compressor & pump. 5. To develop problem solving skills and understanding of power plant cycles. 6. To develop problem solving skills and understanding of refrigerant cycles.

Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Know what the entropy. 2. Recognize how the 1st law of thermodynamics works in open system SSSF. 3. Recognize between energy and exergy. 4. Know the Isentropic Efficiency of Turbine, nozzle, compressor & pump. 5. Know the principles of power plant cycles. 6. Know the principles of refrigerant cycles. 7. Recognize between engine and refrigerant cycles.
Indicative Contents المحتويات الإرشادية	**Indicative content includes the following**. • Introduction, Definition, reversible processes, irreversible processes, irreversibility, entropy, general notices. Open System Unsteady State Steady Flow (U.S.S.S.F.) **[20 hrs]** • Second law of thermodynamics, close systems, open systems, exergy . **[15 hrs]** • Isentropic Efficiency of Turbine, nozzle, compressor & pump. **[20 hrs]** • Power plant cycles, refrigerant cycles. **[20 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 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	79	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	5
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	71	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	5
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	١٥٠		

Module Evaluation
تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	2	10% (20)	5 and 10	LO #1 - #7
	Projects / Lab.	1	10% (10)	Continuous	All
	Report	1	10% (10)	11	LO #3, #5 and #7
Summative assessment	**Midterm Exam**	2hr	10% (10)	8	LO #1 - #4
	Final Exam	٣hr	50% (50)	16	All
Total assessment			100%		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Some Concept and Definitions
Week 2	Open System Unsteady State Steady Flow (U.S.S.S.F.)
Week 3	Entropy
Week 4	Reversible Processes
Week 5	The 2nd law of thermodynamic in close system
Week 6	The 2nd law of thermodynamic in open system
Week 7	Exergy
Week 8	Mid-term Exam
Week 9	Isentropic Efficiency of Turbine
Week 10	Isentropic Efficiency of Compressors & Pump, and Nozzle
Week 11	The Ideal Cycle for Gas-Turbine Engines (Brayton Cycle)
Week 12	Rankin Cycle "Steam Power Plant"
Week 13	The Ideal Reheat Rankin Cycle
Week 14	The Ideal Regenerative RANKINE Cycle
Week 15	Refrigerant cycles
Week 16	**Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: Determining the volumetric expansion coefficient of liquids
Week 2	Lab 2: Converting electrical energy into heat energy– Measuring with a voltmeter and an ammeter (Joule equivalent)
Week 3	Lab 3: Heat engine (Carnot cycle).
Week 4	Lab 4: Refrigerant cycles
Week 5	Lab Exam

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Fundamental of Classical Thermodynamics / Van Wylen	Yes
Recommended Texts	Thermodynamics: an Engineering Approach / Yunus Cengel	Yes
Websites	https://scholar.google.com/scholar?hl=en&as_sdt=0%2C5&q=Thermodynamics%3A+an+Engineering+Approach&btnG=	

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	**Fluid Mechanics II**			**Module Delivery**	
Module Type	**S**			☒ **Theory** ☐ **Lecture** ☒ **Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**UOBAB0301042**				
ECTS Credits	**6**				
SWL (hr/sem)	**150**				
Module Level	UGII		**Semester of Delivery**	Four	
Administering Department	Type Dept. Code		**College**	Type College Code	
Module Leader	Sanaa Abdulrazaq Jassim		**e-mail**	met.sanaa.abd@uobabylon.edu.iq	
Module Leader's Acad. Title	Assist. Professor		**Module Leader's Qualification**	PHD	
Module Tutor			**e-mail**		
Peer Reviewer Name	None		**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	Fluid Mechanics I	**Semester**	3
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	1) To study the fluid mechanics in dynamic science, and why study fluid mechanics, and to understand principle equations for motion. 2) To learn energy equation of fluids in dynamic. 3) Study the applications of continuity and energy equations of fluid, the use of different devices to measure flow rate in closed and open systems. 4) study the Resistance to flow in open and closed conduits, 5) To define Flow in pipes (laminar and turbulent flow). Classify types of losses through pipes flow and calculating them. 6) To learn momentum equations of fluids in dynamic, and their applications. 7) to study Introduction to pumps and Turbines, Application, - Types of pumps and Turbines and types of joining systems. 8) Understand Dimensional analysis - Dimensional analysis (the π-theorem). Dimensionless parameters (Reynolds no., Froude no…..etc.) 9) to carry testing of fluids , measuring fluid flow by venture, measuring major and minor losses in pipe flow, test parallel and series systems of pumps, measuring impact of water jet.

Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1- To understand Steady-state energy equation, draw its energy line and hydraulic line. 2- Applications of continuity and energy equations, flow measurements through closed and open systems. 3- Study Resistance to flow in open and closed conduits. 4- Define Flow in pipes (laminar and Turbulent flow) 5- Calculate Losses in pipes (major and minor losses). 6- Define pumps and Turbines, Types of pumps and Turbines and application . Systems of joining. 7- Understand momentum equations of fluids in dynamic. Calculate momentum force at open and closed systems and their applications 8- Define Dimensional analysis - Dimensional analysis by (the π-theorem). Dimensionless parameters (Reynolds no. , Froude no…..etc.) 9- With regard to the practical side, the program aims to familiarize students with experiments related to flow measurement by venture, measurement of major losses of energy of pipe flow, measuring pressure and flow rate through pipe for pumps at series and parallel, measuring impact of water jet.
Indicative Contents المحتويات الإرشادية	**Indicative content includes the following**. • Steady state energy equation and application of it with continuity equation through open and closed systems (flow measurements) . [20 hr]. • Study the study Resistance to flow in open and closed conduits. Define Flow in pipes (laminar and turbulent flow) and Calculate Losses in pipes (major and minor losses). [20 hr] • Define pumps and Turbines, Types of pumps and Turbines and applications, systems of joining. [10 hr]. • Understand momentum equations of fluids in dynamic. Calculate momentum force at open and closed systems and their applications. [15 hr] • Define Dimensional analysis - Dimensional analysis by (the π-theorem). Dimensionless parameters(Reynolds no., Froude no…..etc) [10 hr]

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	79	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	5
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	71	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	4
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 and 10	LO #1, #2 and #10, #11
	Assignments	2	10% (10)	2 and 12	LO #3, #4 and #6, #7
	Projects / Lab.	1	10% (10)	Continuous	All
	Report	1	10% (10)	13	LO #5, #8 and #10
Summative assessment	Midterm Exam	2hr	10% (10)	7	LO #1 - #7
	Final Exam	3hr	50% (50)	16	All
Total assessment			100%		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Steady-state energy equation
Week 2	Flow Measurement in closed conduits by (Pitot tube), (Venturi meter)
Week 3	Flow Measurement in closed conduits by (orifice meter), (nozzle)
Week 4	Flow Measurement in open conduits by weirs different types of weirs , with applications,.
Week 5	Resistance to flow in closed conduits
Week 6	Resistance to flow in open conduits,
Week 7	Flow in pipes (laminar and Turbulent flow) (Mid-term Exam)
Week 8	Losses in pipes (major and minor losses) (Moody chart)
Week 9	Liner momentum equation and its Application
Week 10	Momentum in Open system (fixed and moving blades).
Week 11	Momentum in Closed system (bend pipes)
Week 12	Introduction to pumps and Turbines. Application, - Types of pumps and Turbines and application
Week 13	Connection between pumps, series and parallel.
Week 14	Dimensional analysis .Dimensional analysis (the π-theorem)
Week 15	Dimensionless fluid parameters(Reynolds no., Froude no…etc.)
Week 16	**Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Experiment 1: Bernoulli's theorem demonstration
Week 2	None
Weeks 3-	Experiment 2: Flow through venture meter.
Week 4-7	None
Week 8	Experiment 3: major losses in pipes.
Week 9	Experiment 4: minor losses in pipes
Week 10	Experiment 5: Impact of jet water
Week 11	Experiment 6: The difference between series and parallel connection of pumps.
Week 12-15	None

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Frank M. White, Fluid Mechanic, fifth edt.,	Yes
Recommended Texts	1- ATextbook of Fluid Mechanics And Hydraulic Machines. 2010 2- FLUID MECHANICS FOR ENGINEERS , 2011	No
Websites	https://www.infobooks.org/free-pdf-books/engineering/fluid-mechanics/ https://www.academia.edu/20207960/Fluid_Mechanics_Textbook	

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

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Module Information معلومات المادة الدراسية					
Module Title	**Strength of Materials**			**Module Delivery**	
Module Type	**S**			☒ **Theory** ☒ **Lecture** ☒ **Lab** ☒ **Tutorial** ☐ **Practical** ☒ **Seminar**	
Module Code	**UOBAB0301043**				
ECTS Credits	**6**				
SWL (hr/sem)	**150**				
Module Level	UGII		**Semester of Delivery**		Four
Administering Department	Type Dept. Code		**College**	Type College Code	
Module Leader	Dr. Ali Hussein Abead Ajaam		**e-mail**	met.ali.abed@uobabylon.edu.iq	
Module Leader's Acad. Title	Lecturer		**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	Engineering Mechanics (Statics)	**Semester**	Two
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	1. Introducing the concept of strength of materials. 2. learning the principles of stress and the associated strain 3. Studying the different types of deformations
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. reviewing some of the important principles of statics 2. introducing the concepts of normal and shear stress and the associated strain 3. discussing the relation between stress and strain for materials that are commonly used in engineering 4. learning how to determine deformation of members subjected to axial loading with and without change in temperature 5. discussing the stress and deformation of shafts or tubes that are subjected to torsion 6. establishing the shear and moment diagrams in beam under bending then computing the stresses and the associated deformation

	7. reviewing and combining stresses learned previously and finding the state of stress 8. showing how to transfer the state of stress into coordinate associated with different orientation 9. computing the deformation (deflection and slope) of beams
Indicative Contents المحتويات الإرشادية	Part 1: structured SWL • Simple Stress: normal stress, shear stress, shear stress equilibrium, bearing stress, allowable stresses (12 h) • stress strain relations : normal strain, shear strain, , normal stress strain diagram, hooks law, Poisson ratio, shear stress strain diagram (6 h) • Axial loading: deformation of axial members, statically indeterminate axial loaded members, thermal stresses. (6 h) • Torsion: shear stress in circular shafts, angle of twist, statically indeterminate torque loaded members. (6 h) • Shear and moment diagrams: equation method of establishing shear force and bending moment diagrams for beams, graphical method of constructing shear and moment diagrams (12 h) • Stresses in beams: bending stress, transvers shear stress (12 h) • combined loading: thin walled vessels, cylindrical vessels, spherical vessels, combined loading in members (12 h) • Stress transformation: equation method of stress transformation, Mohr's circle (12 h) • Deflection in beams: integration method, moment area method (12 h) Part 2: unstructured SWL • problem solving assignments: 10 assignment each contains 3 types of problems (fundamental problems, actual problem, conceptual problems) (38 h) • project problem: selecting, investigating , analysis, and reporting a problem related stress and strain analysis of engineering materials (18 h including 3 h seminar)
Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The main strategy to deliver this module is by encouraging the students to actively participate in solving homework, prepare and take quizzes, and attend discussion groups. This strategy, besides understanding the material, will enhance the student critical thinking.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	94	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	6
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	56	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	4
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 and 12	1,2,3 and 5,6
	Assignments	10	10% (10)	2,3,4,6,7, 10,11,13,14,15	1 through 9
	Laboratory	5	10% (10)	Continuous	1 through 9
	Projects /Report	1	10% (10)	15	7 through 9
Summative assessment	Midterm Exam	2hr	10% (10)	8	1 through 5
	Final Exam	3hr	50% (50)	16	1 through 9
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Introduction, normal stress
Week 2	Shear stress, bearing stress, allowable stress
Week 3	Strain, stress strain relations
Week 4	Axial loading, thermal stress
Week 5	Torsion, angle of twist
Week 6	Shear force and bending moment diagrams
Week 7	Bending stress in beams
Week 8	Midterm Exam
Week 9	Shear stress in beams
Week 10	Thin walled vessels
Week 11	Combined loading
Week 12	Stress transformation 1
Week 13	Stress transformation 2
Week 14	Deflections in beams 1
Week 15	Deflections in beams 2
Week 16	**Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: tension test
Week 2	Lab 2: compression test
Week 3	Lab 3: stress strain relation
Week 4	Lab 4: single vs. double shear
Week 5	Lab 5: torsion test

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Mechanics of Materials By R. C. Hibbeler	Yes
Recommended Texts	Strength of Materials By Pytel and Singer	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 Information معلومات المادة الدراسية					
Module Title	**Principles of Energy Engineering**			**Module Delivery**	
Module Type	**C**			☒ **Theory** ☐ **Lecture** ☐ **Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	UOBAB0301044				
ECTS Credits	**6**				
SWL (hr/sem)	**150**				
Module Level	UGII		**Semester of Delivery**	Four	
Administering Department	Type Dept. Code		**College**	Type College Code	
Module Leader	Wisam J. Khudhayer		**e-mail**	Met.wisam.j@uobabylon.edu.iq	
Module Leader's Acad. Title	Assist. Professor		**Module Leader's Qualification**	PhD	
Module Tutor			**e-mail**	E-mail	
Peer Reviewer Name	None		**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 Objectives أهداف المادة الدراسية	1) Develop an understanding of the concepts of energy, power and work 2) Understand the conservation law of material / energy and perform material / energy balance in energy systems. 3) Enable students to identify and apply fundamental principles of chemistry and physics, as they pertain to energy and fuels, and mathematics to describe materials and energy flow through a process. 4) Enable students to describe the energy transformations in energy systems. 5) In addition, the course will present an introduction to chemical kinetics with an overview of solid, liquid and gaseous fuel transformations.

Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1- Understand the concepts of energy, power, and work 2- Identify the main energy forms 3- Recognize the differences between renewable and non-renewable resources 4- An ability to apply knowledge of mathematics, science, and engineering in Energy-related disciplines 5- An ability to apply material balance on energy-related systems 6- An ability to apply energy balance on energy-related systems 7- Understanding the fundamentals of electrochemical energy conversion
Indicative Contents المحتويات الإرشادية	**Indicative content includes the following**. Principles of energy engineering course will cover the basic engineering calculation and mathematical methodologies on material and energy balances and reaction rates during chemical transformations in energy systems. This is a required introductory course to the BS in energy engineering degree program. Students will be evaluated based on quizzes, homework, class participation, writing report, interactive tutorial and Mid-term and final exams.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The main strategy that will be adopted in delivering this module is to encourage student's participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through lectures, interactive tutorials, assignments, quizzes, and by considering various activities that are interesting to the students such as case-study, seminars, take-home exam, and industrial visits.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	64	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	86	**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, 9 and 13	LO #1-3, #4 and #5-7
	Assignments	2	10% (10)	4 and 8	LO #5, #6, and #7
	Interactive Tutorial	2	10%(10)	6 and 10	LO #5, #6, and #7
	Report	1	10% (10)	13	LO #5, #6, and #7
Summative assessment	**Midterm Exam**	2hr	10% (10)	7	LO #1 - #5
	Final Exam	3hr	50% (50)	16	All
Total assessment			100%		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Introduction to Energy Engineering, Energy, Power, and work Definitions
Week 2	The Law of mass/energy Conservation, Energy Forms, Renewable and non-Renewable Resources.
Week 3	Introduction to Engineering Calculations: Units and Dimensions, The Mole Unit
Week 4	Conventions in Methods of Analysis and Measurements, and Basis.
Week 5	The Chemical Equation and stoichiometry,
Week 6	The Material Balance with/without Chemical Reactions
Week 7	Solving Material Balance Problems Involving Multiple Subsystems,
Week 8	Recycle, By pass, and Purge Calculations
Week 9	Energy Balances, Concepts and Units,
Week 10	Heat Capacity, calculation of enthalpy Changes (without change of phase), and Enthalpy Changes for Phase Transitions
Week 11	The General Energy Balance
Week 12	Reversible Processes and the Mechanical Energy Balance
Week 13	Energy Balance with Chemical Reactions
Week 14	Electrochemical Energy Conversion I
Week 15	Electrochemical Energy Conversion II
Week 16	**Preparatory week before the final Exam**

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	1. David M. Himmelblau, "Basic Principles and Calculations in Chemical Engineering", Fifth Edition, Prentice-Hall International Editions, 1989. 2. Albert P.E. Thumann, "Fundamentals of Energy Engineering" Prentice-Hall 1984 3. Introduction to Energy Engineering, Mihir Sen, Department of Aerospace and Mechanical Engineering, University of Notre Dame Notre Dame, IN 46556 December 2, 2015	YES
Recommended Texts	Colorado Energy Management Handbook, Sixth Edition, 2007, by The Fairmont Press, Colorado, USA.	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 Information معلومات المادة الدراسية					
Module Title	**Computer Programming (MATLAB)**			**Module Delivery**	
Module Type	E			☒ **Theory** ☐ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	UOBAB0301045				
ECTS Credits	**4**				
SWL (hr/sem)	**100**				
Module Level	UGII		**Semester of Delivery**	Four	
Administering Department	Type Dept. Code		**College**	Type College Code	
Module Leader	Ahmed Hadi Hussain		**e-mail**	Met.ahmed.hadi@uobabylon.edu.iq	
Module Leader's Acad. Title	Lecturer		**Module Leader's Qualification**	Msc	
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 Objectives أهداف المادة الدراسية	1. To develop problem solving skills and understanding of differential equations and their solving in practical problems. 2. To understand plotting of functions from a given data. 3. This course deals with the basic concept of Graphic 2D and 3D. 4. This is the basic subject for all methods of differential forms. 5. To understand matrixes and limits Laws problems. 6. To perform mesh and fundamentals of 3D graphs..

Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Recognize the classification of functions with their solving. 2. List the various terms associated with the plotting of functions. 3. Summarize what is meant by differential and integration forms in different applications. 4. Define differential and integral forms in matlab. 5. Identify the basic Looping with for and while, controlling loops with break and continue, terminating execution with return. 6. Discuss the operations of matrices.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. 1- Getting Started to Matlab 2- Structured Programming 3- Matlab Basic Program Components 4- Derivatives & integration and Applications of them 5- Program Control Units 6- Matrices and their types 7- System of linear equation 8- Matlab Graphics 2D 9- Solving systems of linear equations 10- Matlab Graphics 3D

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	49	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	3
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	51	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	3
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 and 10	LO #1, #2 and #10, #11
	Assignments	2	10% (10)	2 and 12	LO #3, #4 and #6, #7
	Projects / Lab.	1	10% (10)	Continuous	All
	Report	1	10% (10)	13	LO #5, #8 and #10
Summative assessment	**Midterm Exam**	2hr	10% (10)	7	LO #1 - #7
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Getting Started to Matlab
Week 2	Structured Programming
Week 3	Interviewing the basic classes in MATLAB, how MATLAB handles matrices as the major variables in the program, basic operations
Week 4	Matlab Basic Program Components
Week 5	The student should get reasonable information of how to use Matlab for structured programming; therefore, structured programming fundamentals are defined before going forward with Matlab
Week 6	Defining Recursive Functions in Matlab
Week 7	Matrices, Matrix and Operations on them (Mid-term Exam)
Week 8	System of linear equation
Week 9	Linear Algebra: First Order Systems
Week 10	Matlab Graphics 2D
Week 11	Matlab Graphics 3D
Week 12	Solve of system linear equations, gauss-eliminations, gauss-Jordan eliminations, grammar Rull
Week 13	Functions of a single or more than single variable ,Plot one dimensions and two dimensions
Week 14	Program Control Units
Week 15	Looping with for and while, controlling loops with break and continue, terminating execution with return
Week 16	**Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: Introduction to Write function : Introducing how to define a function in Matlab. Building and calling a function with different headers through variable arguments
Week 2	Lab 2: types of matrices and Solve of system linear equations by using gauss-eliminations, gauss-Jordan eliminations, grammar Rull
Week 3	Lab 3: Application of recursion with mathematics, using functions to solve serial equations.
Week 4	Lab 4: Looping with for and while, controlling loops with break and continue, terminating execution with return
Week 5	Lab 5: Handling the first order equations and some examples to solve mathematical methods. Differential equations and how Matlab manipulates them are the discussed, in addition to using more properties of the plotting function
Week 6	Lab 6: Basic 2D graphics, various approaches to generate two dimensions graphics.
Week 7	Lab 7: Basic 3D graphics, fundamentals of 3D graphs.

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Essential matlab for engineers and scientist (fifth edition) by Brian H. Hahn and Daniel T. Valentine.	Yes
Recommended Texts	Basic of Matlab and beyond by Andrew Knight	No
Websites	https://www.mathworks.com/academia/courseware/teaching-first-year-engineering-with-matlab-and-simulink.html	

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	**Human Rights and democracy**			**Module Delivery**	
Module Type	B			☒ **Theory** ☐ **Lecture** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	UOBAB0301046				
ECTS Credits	**2**				
SWL (hr/sem)	**50**				
Module Level	UGII		**Semester of Delivery**	Four	
Administering Department	Type Dept. Code		**College**	Type College Code	
Module Leader	Abd Alkhaliq Mahdi		**e-mail**	abdkhaliqmahdi@uobabylon.edu.iq	
Module Leader's Acad. Title	Lecturer		**Module Leader's Qualification**	PhD	
Module Tutor			**e-mail**		
Peer Reviewer Name	None		**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 Objectives أهداف المادة الدراسية	1-زيادة معرفة الطالب بالجانب المفاهيمي النظري والتطور التاريخي لمادة حقوق الانسان والديمقراطية 2-تنمية مهارات الطالب التحليلية والنقدية فيما يتعلق بواقع ومستقبل حقوق الانسان والديمقراطية 3-تدريب الطالب على اهمية المشاركة الفاعلة في جوانب الحياة العامة كتعزيز احترام مبادى حقوق الانسان العامة والمشاركة الفاعلة في الحياة السياسية والثقافية. 4-تمكين الطلاب من فهم اهمية التعليم ودوره في نشر ثقافة حقوق الإنسان والديمقرلطية في بناء مجتمع حضاري يقوم على أساس الحكم الصالح الذي من اهم مقوماته الإيمان بحقوق الإنسان والتربية عليها والمشاركة الفاعلة في الحكم عبر الانتخابات الحرة والعادلة

Module Learning Outcomes مخرجات التعلم للمادة الدراسية	١.يتعلم الطالب خلال السنه الدراسية قوانين ومبادئ حقوق الانسان.1 ٢.اعداد جيل واع بموضوع حقوق الانسان. ٣.ترسيخ مفهوم الحقوق والديمقراطية عند الطلبة وأشاعتها في المجتمع ٤.مواكبة الطالب على تجارب الامم والاطلاع على اهم القرارات والمواثيق والصكوك الدولية في مجال حقوق الانسان والديمقراطية.
Indicative Contents المحتويات الإرشادية	تكمن اهمية مادة حقوق الانسان والديمقراطية من خلال دراسة الطالب لاهم الحقوق التي جاءت في الاعراف والقوانين الدولية فضلا عما جاء في الشريعة الاسلامية والدساتير العراقية لا سيما الدستور النافذ لسنة ٢٠٠٥ فضلا عن معرفة الطالب للمواثيق الدولية التي صدرت بخصوص حقوق الانسان , هذا من جهة ومن جهة اخرى اطلاع الطالب على التجارب الديمقراطية التي سبقتنا للاستفادة منها .

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	1 مناقشة يومية لمعرفة مدى استيعاب الطلبة للمادة ووضع تقييم للمشاركات اليومية. 2 امتحانات يومية باسئلة علمية متنوعة وقصيرة لفهم مدى استيعابهم للمادة. 3 اعطاء جزء من درجة كل فصل للواجبات البيتية. 4 امتحانات يومية (كوزات) و امتحانات شهرية للمنهج الدراسي والامتحان النهائي

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	33	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	17	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	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	20% (20)	5 and 10	All
	Assignments	2	10% (10)	2 and 12	All
	Projects				
	Report	1	10% (10)	13	All
Summative assessment	**Midterm Exam**	2hr	10% (10)	7	All
	Final Exam	2hr	50% (50)	16	All
Total assessment			100%		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	مفهوم حقوق الانسان وخصائصها ومميزاتها
Week 2	حقوق الانسان في التاريخ القديم
Week 3	الشخصية القانونية تعريفها ومميزاتها
Week 4	موقف الشرائع السماوية والحضارات الغربية من حقوق الانسا ن
Week 5	مصادر حقوق الانسان المصادر الدولية لحقوق الانسان- –
Week 6	المصادر الوطنية لحقوق الانسا ن
Week 7	ضمانات حقوق الانسان الضمانات الدولية والإقليمية- – امتحان نصف الفصل
Week 8	الضمانات الوطنية ضمانات حقوق الانسان في الإسلام- –
Week 9	التطور التاريخي لحقوق الأطفال وحق الأطفال في الاتفاقات الدولية
Week 10	الديمق ا رطية مفهومها والتطور التاريخي للديمق ا رطي ة
Week 11	اركان الديمقراطية
Week 12	الانتخابات الديمقراطية
Week 13	أنواع نظمة الحكم الديمقراطية
Week 14	مبدأ سيادة القانون ومبدأ الفصل بين السلطات
Week 15	أثر الاعلام والعولمة في مجال حقوق الانسان
Week 16	

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	د. حميد حنون خالد ، حقوق الانسان	Yes
Recommended Texts	د. فخري رشيد المهنة ود. صلاح ياسين داود ، المنظمات الدولية ، جامعة الموصل.	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.

UGIII – level
Semester – Five

Module Information معلومات المادة الدراسية					
Module Title	**Engineering Analysis**			**Module Delivery**	
Module Type	**S**			☒ **Theory** ☐ **Lecture** ☐ **Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	UOBAB0301051				
ECTS Credits	**6**				
SWL (hr/sem)	150				
Module Level	UGIII		**Semester of Delivery**	Five	
Administering Department	Type Dept. Code		**College**	Type College Code	
Module Leader	Bashar Abid Hamza		**e-mail**	met.basher.abid@uobabylon.edu.iq	
Module Leader's Acad. Title	Assistant 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	Mathematics, Applied Mathematics, Engineering Mathematics.	**Semester**	1,2,3
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	After completing the course, students should be able to solve the D.E in all types when appear in engineering problems. Also unable to use D.E. of wave and D.E. of heat in his fields.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1- Enable student to solve ordinary differential equations of first order (separable, homogeneous, exact) 2- Enable student to solve Nonhomogeneous linear ordinary differential equations 3- Enable student to solve Simultaneous linear ordinary differential equations 4- Enable student to solve One-dimensional wave equation. 5- Enable student to solve Three-dimensional heat equation. 6- After completing the course, students should be able to solve the D.E in all types when appear in engineering problems

Indicative Contents المحتويات الإرشادية	**Indicative content includes the following.** • Ordinary differential equations of first order. **[9 hrs]** • Linear ordinary differential equation with constant coefficients. **[9 hrs]** • Simultaneous linear O. D.E**. [6 hrs]** • Fourier series. **[9 hrs]** • Partial D.E. and boundary value problems. **[12 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	64	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	86	**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	5% (5)	3 and 10	LO #1 - #3
	Assignments	2	5% (5)	4 and 11	LO #1 - #3
	Projects / Lab.				
	Report				
Summative assessment	**Midterm Exam**	2hr	30% (30)	4 and 12	LO #1 - #4
	Final Exam	٣hr	40% (40)	16	All
Total assessment			100%		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Ordinary differential equations of first order.
Week 2	Ordinary differential equations of first order.
Week 3	Ordinary differential equations of first order.
Week 4	Linear ordinary differential equation with constant coefficients.
Week 5	Linear ordinary differential equation with constant coefficients.
Week 6	Linear ordinary differential equation with constant coefficients.
Week 7	Simultaneous linear O. D.E.
Week 8	Simultaneous linear O. D.E.
Week 9	Fourier series
Week 10	Fourier series
Week 11	Fourier series
Week 12	Partial D.E. and boundary value problems
Week 13	Partial D.E. and boundary value problems
Week 14	Partial D.E. and boundary value problems
Week 15	Partial D.E. and boundary value problems
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, C.RAY WYLIE.	No
Recommended Texts	Advanced engineering mathematics, Kreyszig	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 Information معلومات المادة الدراسية					
Module Title	**Electrical Machines**			**Module Delivery**	
Module Type	**S**			☒ **Theory** ☐ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	UOBAB0301052				
ECTS Credits	**5**				
SWL (hr/sem)	125				
Module Level	UGIII		**Semester of Delivery**	Five	
Administering Department	Type Dept. Code		**College**	Type College Code	
Module Leader	Ali Sabri Allw		**e-mail**	met.ali.sabry@uobabylon.edu.iq	
Module Leader's Acad. Title	Assist Professor		**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 Objectives أهداف المادة الدراسية	• To develop problem solving skills and understanding of AC machine. • To understand the application of Ac machines. • To understand of winding methods. • To understand of rotating field methods. • To develop problem solving skills and understanding voltage regulation of machines .
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	• Know AC Machine • Recognize how AC winding design. • Know and used Synchronous Generators. • Know the electrical circuit of Synchronous Generators. • Know the method of winding. • Know the speed control of machines.

Indicative Contents المحتويات الإرشادية	**Indicative content includes the following**. • Classification of AC Rotating Machines and winding, [20 hrs] • Synchronous Generators, Synchronous Motors. **[20 hrs]** • Induction Motor, Induction Generators, Induction regulator, Speed motor. **[20hrs]**

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 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	60	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	65	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	4
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% (20)	5 and 10	LO #3 - #6
	Lab.	1	10% (10)	Continuous	All
	Projects	1	10% (10)	10	LO #3, #5 and #5
Summative assessment	**Midterm Exam**	2hr	10% (10)	9	LO #1 - #4
	Final Exam	٣hr	50% (50)	16	All
Total assessment			100%		

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
Week 1	Introduction to AC Machine
Week 2	Energy Conversion
Week 3	AC winding design
Week 4	Rotating Magnetic Field
Week 5	Magnetomotive Force (mmf) of AC Windings
Week 6	Synchronous Generators

Week 7	Round Rotor Machines
Week 8	Synchronous generator equivalent circuit
Week 9	Mid –term Exam
Week 10	Synchronous Motors
Week 11	Synchronous Motor equivalent circuit
Week 12	Induction generator
Week 13	Induction Motors
Week 14	Speed control of induction motor
Week 15	Induction Regulator
Week 16	**Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: Calculate the dryness fraction for wet steam
Week 2	Lab 2: Find the pressure curve for steam
Week 3	Lab 3: Verification of Boyle's law.
Week 4	Lab 4: Verification of Charles's law
Week 5	Lab Exam

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	• M.G.Say / Alternating Current Machines / Pitman Pub. • A.S. Langsdorf / Theory of AC Machinery / McGRAW-HILL Pub.	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 Information معلومات المادة الدراسية					
Module Title	**Heat Transfer - Conduction**			**Module Delivery**	
Module Type	**S**			☒ **Theory** ☐ **Lecture** ☒ **Lab** ☒ **Tutorial** ☐ **Practical** ☒ **Seminar**	
Module Code	UOBAB0301053				
ECTS Credits	**5**				
SWL (hr/sem)	**125**				
Module Level	UGIII		**Semester of Delivery**	Five	
Administering Department	Type Dept. Code		**College**	Type College Code	
Module Leader	Aws Akram Mahmood		**e-mail**	Aws.al-akam@uobabylon.edu.iq	
Module Leader's Acad. Title	Lecturer		**Module Leader's Qualification**	PHD	
Module Tutor			**e-mail**		
Peer Reviewer Name	None		**e-mail**	E-mail	
Scientific Committee Approval Date			**Version Number**	1.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	Thermodynamics, Fluid Mechanics	**Semester**	Two
Co-requisites module	NA	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	This course is designed to introduce a basic study of the phenomena of heat and mass transfer, to develop methodologies for solving a wide variety of practical engineering problems, and to provide useful information concerning the performance and design of particular systems and processes. A knowledge-based design problem requiring the formulations of solid conduction and the technique of numerical computation progressively elucidated in different chapters will be assigned and studied in detail. As well, to gain experience in designing experiments for thermal systems, the design, fabrication, and experimentation of a thin film heat flux gage will be attempted as part of laboratory requirements.

Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1- Understand the basic laws of heat transfer. 2- Account for the consequence of heat transfer in thermal analyses of engineering systems. 3- Analyze problems involving steady state heat conduction in simple geometries. 4- Develop solutions for transient heat conduction in simple geometries. 5- Obtain numerical solutions for conduction and radiation heat transfer problems. 6- Solve problems related to heat losses in the building. 7- Suggests thermal insulations of system for variety of engineering problems.
Indicative Contents المحتويات الإرشادية	**Indicative content includes the following**: - Contact hours: 79 hrs. - Independent Study (preparation for course and review of materials): 30 hrs. - Independent Study (preparation for class test): 16 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 Reformulate complex engineering problems in order to solve them (simplifying assumptions, reducing complexity). Also, this may include a conceiving, plan and execute a research project, based on an analysis of its objectives, existing knowledge and the relevant literature. Correctly report on design results in the form of a technical report or in the form of a scientific paper. Present and defend results in a scientifically sound way, by performing seminars.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	79	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	5
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	46	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	3
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 and 10	LO #1, #2 and #7
	Assignments	2	10% (10)	2 and 12	LO #3, #4 and #6, #7
	Projects / Lab.	4	10% (10)	NA	NA
	Report	1	10% (10)	13	LO #5, #8
Summative assessment	**Midterm Exam**	2hr	10% (10)	7	LO #1 - #7
	Final Exam	3hr	50% (50)	16	All
Total assessment			100%		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	**Introduction heat transfer mechanisms**
Week 2	**Conduction heat transfer**
Week 3	**Conduction heat transfer – through walls**
Week 4	**Conduction heat transfer – through cylindrical walls**
Week 5	**Conduction heat transfer – through spherical walls**
Week 6	**Thermal resistance networks**
Week 7	**Midterm Exam**
Week 8	**Heat transfer through the extended surfaces (FINS)**
Week 9	**Heat transfer with heat generation**
Week 10	**Unsteady heat transfer**
Week 11	**Two-Dimensional Heat transfer 1**
Week 12	**Two-Dimensional Heat transfer 2**
Week 13	**Midterm Exam**
Week 14	**Heat Sink design for Cooling of electronic Equipment**
Week 15	**Review**
Week 16	**Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	**Study of conduction heat transfer in composite wall**
Week 2	**Report submission and discussion**
Weeks 3-4	**Study of heat transfer through liquid**
Week 5	**Report submission and discussion**
Week 6	**Two-Dimensional Heat transfer in a plate representation**
Weeks 7-9	**Report submission and discussion**
Weeks 10	**Study the temperature distribution along the length of a pin**

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Heat Transfer a practical approach, Yunis A. Cengel 3rd Ed	yes
Recommended Texts	Fundamental of heat and mass transfer, Incropira, 7th Ed	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 Information معلومات المادة الدراسية					
Module Title	**Mechanical Element Design & CAD**			**Module Delivery**	
Module Type	S			☒ **Theory** ☐ **Lecture** ☐ **Lab** ☒ **Tutorial** ☒ **Practical** ☐ **Seminar**	
Module Code	UOBAB0301054				
ECTS Credits	5				
SWL (hr/sem)	125				
Module Level	UGx1 3		**Semester of Delivery**	Five	
Administering Department	Type Dept. Code		**College**	Type College Code	
Module Leader	Ahmed Waleed Hussein		**e-mail**	msb.ahmed.waleed@uobabylon.edu.iq	
Module Leader's Acad. Title	Lecturer		**Module Leader's Qualification**	PhD	
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	Strength of Materials	**Semester**	Two
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	**Objective 1:** To teach students how to apply the concepts of stress analysis, theories of failure and material science to analyze, design and/or select commonly used machine components. **Objective 2:** To illustrate to students the variety of mechanical components available and emphasize the need to continue learning. **Objective 3:** To teach students how to apply mechanical engineering design theory to identify and quantify machine elements in the design of commonly used mechanical systems. **Objective 4:** To teach students how to apply computer based techniques in the analysis, design and/or selection of machine components. **Objective 5:** Construct Prototypes (3D-Models) using Solidworks

Module Learning Outcomes مخرجات التعلم للمادة الدراسية	**Objective 1 :**The students will demonstrate the ability to apply the fundamentals of stress analysis, theories of failure and material science in the design of machine components. The students will demonstrate the ability to make proper assumptions, perform correct analysis while drawing upon various mechanical engineering subject areas. **Objective 2:** Students will demonstrate the ability to seek and learn new material in addition to the class topics through the completion of an open-ended project. The amount as well as the depth of new material identified and used by the students are measurable indicators of the students' performance. **Objective 3** Students will demonstrate the ability to take technical, safety, legislative and other issues such as environmental into account when selecting and/or designing mechanical systems, in particular with respect to those components and systems defined in the topical areas and performance criteria. The breadth and depth of the issues taken into account by students are measurable indicators of their performance. **Objective 4** Students will demonstrate their ability to use existing as well as develop new Computer-based techniques and algorithms for the analysis, selection, and synthesis of mechanical components, in particular with respect to those components and systems defined in the topical areas and performance criteria 1.3. The breadth and depth of the issues taken into account by students are measurable indicators of their performance. **Objective 5** Obtain the basic competencies of 3D modeling as it relates to applications of the engineering design process **Objective 6** Acquire basic industry skill sets in 3D CAD and related manufacturing processes to recognize how products work and how products are manufactured
Indicative Contents المحتويات الإرشادية	**Indicative content includes the following**. 1 Introduction to Mechanical Design – Course Overview, Design 2 Process; Materials – Material Properties, Materials Selection, 3 Combined Loading (5 h) 4 Failures Resulting from Static Loading – Static Strength, Stress 5 Concentration, Failure Theories for Ductile and Brittle Materials (10 h) 6 Fatigue Failure Resulting from Variable Loading, Fatigue Strength 7 and Endurance Limits, Fluctuating Stresses and Influence of Non-zero Mean Stress, Combination of Loading Modes (10 h) 8 Shafts and Shaft Components – Shaft Materials, Shaft Layout, 9 Shaft design for Stress, Deflection Considerations, Critical Speeds 10 for Shafts (10 h) 11 Screws, Fasteners and the Design of Nonpermanent Joints – 12 Thread Standards and Definitions, Threaded Fasteners, Joints, Bolt 13 Strength (10 h) 14 Welding (10 h) 15 Fasteners (10 h) 16 Construct 2D and 3D Models using Solidworks. (10 h)

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	79	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	5
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	46	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	3
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	5% (10)	5 and 10	LO #1, #2
	Practice	1	10% (10)	Continuous	LO #4, #5, #6
	Report	1	5% (10)	6	LO #1, #2
	Midterm Exam	4hr	30% (30)	7 and 13	LO #1 - #3
Summative assessment	**Final Exam**	3hr	50% (50)	16	LO #1 - #3
	100%				

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Introduction to machine design & Material classification
Week 2	Failures Resulting From Static Loading: Ductile martials, Application example in Solidworks
Week 3	Failures Resulting From Static Loading: Brittle martials, Application example in Solidworks
Week 4	Fatigue Failure : SN diagram
Week 5	Fatigue Failure : Theories of fatigue failures
Week 6	Fatigue Failure : Theories of fatigue failures, Application example in Solidworks
Week 7	Fatigue Failure : Theories of fatigue failures
Week 8	Shafts and Shaft Components: Shaft Design, Application example in Solidworks
Week 9	Shafts and Shaft Components: Key design, Application example in Solidworks
Week 10	Welding design
Week 11	Welding design

Week 12	Welding design
Week 13	Screws and fasteners
Week 14	Screws and fasteners
Week 15	Screws and fasteners
Week 16	**Exam**

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Mechanical Engineering Design, J. Shigley, Eighth Edition,2008	Yes
Recommended Texts	Machine design: an Integrated approach, Norton,3rd edition, 2006	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 Information معلومات المادة الدراسية					
Module Title	**Hydrogen Energy and Fuel Cells**			**Module Delivery**	
Module Type	C			☒ **Theory** ☐ **Lecture** ☒ **Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	UOBAB0301055				
ECTS Credits	**5**				
SWL (hr/sem)	**125**				
Module Level	UGIII		**Semester of Delivery**	Five	
Administering Department	Type Dept. Code		**College**	Type College Code	
Module Leader	Wisam J. Khudhayer		**e-mail**	met.wisam.j@uobabylon.edu.iq	
Module Leader's Acad. Title	Assist. Professor		**Module Leader's Qualification**	PhD	
Module Tutor			**e-mail**	E-mail	
Peer Reviewer Name	None		**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 Objectives أهداف المادة الدراسية	1- To understand the expectances of the hydrogen as a fuel and energy vector in the context of the renewable energy without carbon dioxide production. 2- Students will learn the basic principles of electrochemical energy conversion while being exposed to relevant topics in materials science, thermodynamics, reaction kinetics, heat and mass transfer and fluid mechanics.

Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1- List the cell reaction, electrolyte and electrode materials, compatible fuels, typical operating conditions and common applications of the most important fuel cell technologies 2- Explain the fundamental working principle of various types of fuel cell 3- Determine from thermodynamic principles the reversible cell voltage of a fuel cell, and how it depends on temperature, pressure and reactant concentrations 4- Name the most important performance loss mechanisms of PEMFCs, and describe how they relate to the material and structural properties of the fuel cell 5- Explain the theoretical derivation of Nernst, Butler-Volmer, and Tafel equations, and use them to interpret experimental result and evaluate performance of catalyst and electrode materials 6- Describe and evaluate the efficiency and operating characteristics of PEMFCs through a fuel cell model, and determine its parameters by fitting to experimental polarization curves 7- Describe the properties of hydrogen as a fuel, and its safety aspects, production, delivery, and storage technologies 8- Sketch and perform simple design calculations of fuel cell systems for portable, transportation and combined heat and power production
Indicative Contents المحتويات الإرشادية	**Indicative content includes the following**. Electrochemical fuel cells represent the most efficient means for converting the chemical energy stored in a fuel to readily usable electrical energy. Fuel cells offer tremendous advantages in energy efficiency and reduced pollution in comparison to energy conversion by heat engines. This course introduces students to aspects of fuel cell engineering, with emphasis fuel cell systems, stacks, and single cells. Fuel cell concepts will be illustrated with quizzes, assignments, class participation, interactive tutorials, Mid-term and final exams , and laboratory reports.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The main strategy that will be adopted in delivering this module is to encourage student's participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through lectures, interactive tutorials, quizzes, assignments, lab experiments and by considering various activities that are interesting to the students such as seminars, take-home exam, and industrial visits.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	79	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	5
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	46	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	3
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, 9 and 12	LO #1-4, #5-6 and #7-8
	Assignments	2	10% (10)	4 and 8	LO #3 and #6
	Interactive Tutorial	2	10%(10)	6 and 10	LO #3 and #4-6
	Lab	8	10% (10)	3-10	LO #3-6
Summative assessment	Midterm Exam	2hr	10% (10)	7	LO #1 - #3
	Final Exam	3hr	50% (50)	16	All
Total assessment			100%		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Introduction to Hydrogen Energy and Fuel Cell Technology
Week 2	Basic Electrochemical Principles I
Week 3	Basic Electrochemical Principles II
Week 4	Fuel Cell Thermodynamics I
Week 5	Fuel Cell Thermodynamics II
Week 6	Fuel Cell Reaction Kinetics I
Week 7	Fuel Cell Reaction Kinetics II
Week 8	Fuel Cell Reaction Kinetics II
Week 9	Transport in Fuel Cell Systems I
Week 10	Transport in Fuel Cell Systems II
Week 11	Fuel Cell Characterization
Week 12	Fuel Cell Applications
Week 13	Polymer Electrolyte Fuel Cells
Week 14	Hydrogen Storage, Production, and Dilevery
Week 15	design calculations of fuel cell systems for portable, transportation and combined heat and power production
Week 16	**Preparatory week before the final Exam**
Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 3	Introduction to Lab tools and instruments
Week 4	Characteristic curve of the Electrolyser
Week 5	Faraday's Laws part:1
Week 6	Faraday's Laws part:2
Week 7	Water = 2 part of Hydrogen + 1 part of Oxygen
Week 8	Characteristic Curves of the Fuel cell Connected in parallel
Week 9	Faraday Efficiency and Energy Efficiency of the Electrolyser
Week 10	Faraday Efficiency and Energy Efficiency of the Fuel Cell

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	"Fuel Cell Engines", Matthew M. Mench, 2008 by John Wiley & Sons, Inc.	YES
Recommended Texts	Fuel Cell Handbook	No
Websites	(http://www.seca.doe.gov/tutorial/pdf/FCHandbook6.pdf)	

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	**Fossil fuel**			**Module Delivery**	
Module Type	**C**			☒ **Theory** ☐ **Lecture** ☐ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	UOBAB0301056				
ECTS Credits	**4**				
SWL (hr/sem)	100				
Module Level	UGIII		**Semester of Delivery**	Five	
Administering Department	Type Dept. Code		**College**	Type College Code	
Module Leader	Watheq Naser Hussein		**e-mail**	met.watheq.naser@uobabylon.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 Objectives أهداف المادة الدراسية	1.to get overview about the types of fuels 2.to learn about fossils 3.to learn about how to exploit energy from fossils 4.to learn about the properties of oils and their estimations 5.to get insight regarding pollution from fossils
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	7. What is fossil 8. How can one make a comparison between several types of wastes? 9. How can one reflect handling of fossils in Iraq? 10. are there any problems regarding fossils regarding the pollution and the hazards 11. Can one use waste or some of it to compensate for fossils?. 12. Processing of oil and its products properties? 13. What are the types of natural? 14. What is petrochemical? 15. Strategies used for improving fossils exploitation in Iraq

Indicative Contents المحتويات الإرشادية	**Indicative content includes the following**. • Types of fuels, uses, and problems. **[5 hrs]** • Type of fossils that can be used and their energy. **[5 hrs]** • Gravity and API meaning and estimation. [4 hrs] • Oil products and their properties [4 hrs] • Natural and synthetic gas caracterististics [2 hrs] • Gas processing before using to consumer . **[10 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 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	34	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	66	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	5
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**١00**		

Module Evaluation
تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	2	10% (20)	5 and 10	LO #1 - #5
	assignments	2	10%(10)	4 and 9	LO#1-#8
	report	1	10% (10)	13	LO #6, #7 and #9
Summative assessment	**Midterm Exam**	2hr	10% (10)	7	LO #1 - #6
	Final Exam	٣hr	50% (50)	16	All
Total assessment			100%		

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
Week 1	Introduction and definition of fuels
Week 2	Types of fossils
Week 3	Energy estimation of fossils and the related pollution consideration
Week 4	API meaning and estimation
Week 5	Oil products and properties

Week 6	Oil refinery and production
Week 7	Gas and uses
Week 8	Synthetic gases
Week 9	Type of gas for consumption
Week 10	Processing of gas
Week 11	Transportation of gas
Week 12	Petrochemical industry
Week 13	Global warming regarding fossils
Week 14	Pollution in oil industry
Week 15	Transportation of oil
Week 16	**Preparatory week before the final Exam**

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Energy Sources Fundamentals of Chemical Conversion Processes and Applications, Author: Balasubramanian Viswanathan	no
Recommended Texts	Fossil Energy, author, Ripudaman Malhotra	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.

UGIII – level
Semester – Six

Module Information معلومات المادة الدراسية			
Module Title	**Numerical analysis**	**Module Delivery**	
Module Type	E	☒ **Theory** ☐ **Lecture** ☐ **Lab** ☐ **Tutorial** ☒ **Practical** ☐ **Seminar**	
Module Code	UOBAB0301061		
ECTS Credits	**6**		
SWL (hr/sem)	**150**		
Module Level	UGIII	**Semester of Delivery**	Six
Administering Department		**College**	
Module Leader	Wisam Naji hassan	**e-mail**	msb.wissam.naji@uobabylon.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 Objectives أهداف المادة الدراسية	To enable the students to : 1- Find the solution of the first order and second order equation with constant coefficient . 2- Find the solution of ordinary differential equation of first order by Euler, Taylor and Runge-Kutta methods. 3- Derive Least – Squares curve fitting procedures, fitting a straight line, nonlinear curve fitting, Curve fitting by a sum of exponentials. 4- Find the derivatives using Newton's forward difference formula, Newton's backward difference formula, Derivatives using central difference formulae, Stirling's interpolation formula, Newton's divided difference formula, Maximum and minimum values of a tabulated function. 5- Derive Trapozoidal rule, Simpson's 1/3 – rule and Simpson's 3/8 – rule. 6- Find the solution of linear systems by using Direct methods, Matrix inversion method, Gaussian elimination methods, Gauss-Jordan Method. 7- To improve the student's skills in numerical methods by using the numerical analysis software and computer facilities.

Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1- Acquire basic knowledge in solving interpolation with equal interval problems by various numerical methods. 2- Estimate the missing terms through interpolation methods. 3- Develop skills in analyzing the methods of interpolating a given data, properties of interpolation with unequal intervals and derive conclusions, approximate a function using an appropriate numerical method. 4- Use relevant numerical techniques for interpolation with equal and unequal intervals by using various central difference formulae and code a numerical method in a modern computer language. 5- Apply appropriate numerical methods to solve the problem with most accuracy. 6- Be able to derive Least – Squares curve fitting procedures, fitting a straight line, fitting a parabola, nonlinear curve fitting, Curve fitting by a sum of exponentials. 7- Be able to find the derivatives using Newton's forward difference formula, Newton's backward difference formula, Derivatives using central difference formulae, Stirling's interpolation formula, Newton's divided difference formula, Maximum and minimum values of a tabulated function. 8- Be able to derive Trapozoidal rule, Simpson's 1/3 – rule and Simpson's 3/8 . 9- Be able to find the solution of linear systems by using Direct methods, Matrix inversion method, Gaussian elimination methods, Gauss-Jordan Method. 10- Be able to find the find the solution of ordinary differential equation of first order by Euler, Taylor and Runge-Kutta methods . 11- Compare different methods in numerical analysis with accuracy and efficiency of solution. Employ Finite difference to solve O.D.E. boundary value problems and Elliptic P.D.E. 8- Write computer programs to implement all the above numerical solution methods Employ Finite difference to solve O.D.E. boundary value problems and Elliptic P.D.E. 8- Write computer programs to implement all the above numerical solution methods Employ Finite difference to solve O.D.E. boundary value problems and Elliptic P.D.E. 8- Write computer programs to implement all the above numerical solution methods 12- Employ Finite difference to solve O.D.E and P.D.E. 13- Implement numerical methods in Matlab.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. Introduction ,Newton-Raphson Method.[5hrs], Solutions Of Linear System.[5hrs], Curve Fitting.[5hrs], Interpolation.[5hrs], Interpolation.[5hrs], Numerical Differentiation.[5hrs], Numerical Integration.[5hrs], Numerical Integration.[5hrs], Initial Value Problems For Ordinary Differential Equations.[5hrs], Initial Value Problems For Ordinary Differential Equations.[5hrs], Finite Difference Method.[5hrs], Finite Difference Solution For One-Dimensional Heat Equation.[5hrs], Finite Difference Solution For One-Dimensional Wave Equation.[5hrs], Finite Difference Solution For One-Dimensional Wave Equation.[5hrs] Finite Difference Solution For Two-Dimensional Laplace And Poisson Equations. .[5hrs]

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	64	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	86	**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**	3	10% (10)	4,9and 13	LO 1,2,3,4,5,6,7,8,and 12
	Assignments	5	10% (10)	2 and 12	LO 2,4,6,10, and 13
	Projects / Lab.	1	10% (10)	Continuous	All
	Report				
Summative assessment	**Midterm Exam**	2hr	10% (10)	7	LO #1 - #7
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Introduction ,Newton-Raphson Method
Week 2	Solutions Of Linear System
Week 3	Curve Fitting
Week 4	Interpolation
Week 5	Interpolation
Week 6	Numerical Differentiation
Week 7	Numerical Integration
Week 8	Numerical Integration
Week 9	Initial Value Problems For Ordinary Differential Equations
Week 10	Initial Value Problems For Ordinary Differential Equations
Week 11	Finite Difference Method
Week 12	Finite Difference Solution For One-Dimensional Heat Equation
Week 13	Finite Difference Solution For One-Dimensional Wave Equation
Week 14	Finite Difference Solution For One-Dimensional Wave Equation
Week 15	Finite Difference Solution For Two-Dimensional Laplace And Poisson Equations
Week 16	**Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Introduction to MATLAB
Week 2	Introduction to Functions and Plot.
Week 3	Newton Raphson
Week 4	Gaussian elimination, Jacobi, Gauss Seidel methods
Week 5	Lagrange's interpolation formula, Newton's divided difference formula
Week 6	Trapezoidal rule, Simpson's 1/3,3/8-rules
Week 7	Euler's method modified Euler's method, Runge-Kutta method
Week8	Numerical solution of an elliptic boundary value problem using the method of finite differences.

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Numerical Methods, by R. W. Hornbeck.	No
Recommended Texts	Numerical Methods Using MATLAB, by J. H. Mathew and K. D. Fink.	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 Information معلومات المادة الدراسية					
Module Title	**Waste management and bio-energy**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☐ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	UOBAB0301062				
ECTS Credits	**5**				
SWL (hr/sem)	125				
Module Level	UGIII		**Semester of Delivery**	Six	
Administering Department	Type Dept. Code		**College**	Type College Code	
Module Leader	Watheq Naser Hussein		**e-mail**	met.watheq.naser@uobabylon.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 Objectives أهداف المادة الدراسية	1.to get overview about the types of waste 2.to learn how deal with waste 3.to learn about how to exploit energy from waste 4.to learn about how to use bacteria in harvesting energy 5.to diagnose the type of bacteria and the related parameters affecting their performance

Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1) What is waste 2) How can one make a benefit of using waste? 3) How can one reflect handling of waste in Iraq? 4) are there any problems regarding the wastes regarding the pollution and the hazards 5) Can one use waste or some of it to compensate for fossils?. 6) How can one use bacteria in producing energy from waste? 7) What are the models describing item 6? 8) How to design digester? 9) To couple the relevant parameters with other physics such as computer programming and economic considerations?
Indicative Contents المحتويات الإرشادية	**Indicative content includes the following**. • Types of wastes, uses, problems and uses. **[15 hrs]** • Type of waste that can be bio degradable. **[10 hrs]** • Bacteria, growth and functionality and factors affecting their living. [10 hrs] • Bioreactors types, material and energy balances0 [15 hrs] • Energy storage in biofuel system [5 hrs] • The role of enzyme and catalysts in bioenergy in some applied processes. **[5 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 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	64	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	61	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	4
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	١٥٠		

Module Evaluation
تقييم المادة الدراسية

As		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	2	10% (20)	5 and 10	LO #1 - #5
	Lab.	1	10% (10)	Continuous	All
	report	1	10% (10)	13	LO #6, #7 and #9
Summative assessment	**Midterm Exam**	2hr	10% (10)	7	LO #1 - #5
	Final Exam	٣hr	50% (50)	16	All
Total assessment			100%		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Introduction and definition
Week 2	Types of wastes, problems and benefits
Week 3	Composition of Solid Wastes
Week 4	Separation, processing and transformation of solid waste
Week 5	Bio process definition
Week 6	Type of bacteria and their functions
Week 7	SANITARY AND BIOREACTOR LANDFILLS
Week 8	Biogas Characteristics
Week 9	Type of biodegradable waste
Week 10	Type of bioreactors, mass and energy balances
Week 11	Comparision of Buswell and combustion process
Week 12	Biogas Characteristics
Week 13	Global warming regarding waste
Week 14	Catalysis in bioenergy
Week 15	Applied examples of bioprocess
Week 16	**Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: Bacteria diagnosis
Week 2	Lab 2: factors affecting bacteria and growing
Week 3	Lab 3: bio energy experiment
Week 4	Lab 4: catalysis in bioenergy
Week 5	Lab Exam

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Textbook of Solid Wastes Management by Ahsan Iqbal	no
Recommended Texts	1.Solid wastes problems and benefits 2. Biomass as a Sustainable Energy Source for the Future: Fundamentals of Conversion Processes, Editor(s):Wiebren De Jong, J. Ruud Van Ommen	no
Websites	https://www.researchgate.net/publication/366412279_Solid_Wastes_Problems_and_Benefits	

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	**Heat Transfer – Convection & radiation**			**Module Delivery**	
Module Type	**S**			☒ **Theory** ☐ **Lecture** ☒ **Lab** ☒ **Tutorial** ☐ **Practical** ☒ **Seminar**	
Module Code	UOBAB0301063				
ECTS Credits	**5**				
SWL (hr/sem)	**125**				
Module Level	UGIII		**Semester of Delivery**	Six	
Administering Department	Type Dept. Code		**College**	Type College Code	
Module Leader	Aws Akram Mahmood		**e-mail**	Aws.al-akam@uobabylon.edu.iq	
Module Leader's Acad. Title	Lecturer		**Module Leader's Qualification**	PHD	
Module Tutor			**e-mail**		
Peer Reviewer Name	None		**e-mail**	E-mail	
Scientific Committee Approval Date			**Version Number**	1.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	Thermodynamics, Fluid Mechanics, Hea transfer -Conduction	**Semester**	2
Co-requisites module	NA	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	This course is designed to introduce a basic study of the phenomena of heat and mass transfer, to develop methodologies for solving a wide variety of practical engineering problems, and to provide useful information concerning the performance and design of systems and processes. A knowledge-based design problem requiring the formulations of fluid convection. As well, to gain experience in designing experiments heat exchangers. Furthermore, the student will be analysis the heat transfer by radiation mechanism.
Indicative Contents المحتويات الإرشادية	**Indicative content includes the following**: - Contact hours: 79 hrs. - Independent Study (preparation for course and review of materials): 30 hrs. - Independent Study (preparation for class test): 16 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 Reformulate complex engineering problems in order to solve those (simplifying assumptions, reducing complexity). Also, this may include a conceiving, plan and execute a research project, based on an analysis of its objectives, existing knowledge and the relevant literature. Correctly report on design results in the form of a technical report or in the form of a scientific paper. Present and defend results in a scientifically sound way, by performing seminars.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	79	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	5
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	46	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	3
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 and 10	LO #1, #2 and #7
	Assignments	2	10% (10)	2 and 12	LO #3, #4 and #6, #7
	Projects / Lab.	4	10% (10)	NA	NA
	Report	1	10% (10)	13	LO #5, #8
Summative assessment	**Midterm Exam**	2hr	10% (10)	7	LO #1 - #7
	Final Exam	3hr	50% (50)	16	All
Total assessment			100%		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	**Introduction to convection heat transfer**
Week 2	**Forced Convection Heat Transfer**
Week 3	**Internal flow convection heat transfer**
Week 4	**External Flow heat transfer**
Week 5	**Natural convection**
Week 6	**Exam**
Week 7	**Heat Exchangers 1**
Week 8	**Heat exchangers 2**
Week 9	**Introduction to radiation heat transfer**
Week 10	**Radiation heat transfer**
Week 11	**Exam**
Week 12	**Mass transfer 1**
Week 13	**Mass transfer 2**
Week 14	**Cooling of electronic Equipment**
Week 15	**Review**
Week 16	**Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	study the temperature distribution along the length of a pin under free convection heat transfer
Week 2	Report submission and discussion
Weeks 3-4	study the temperature distribution along the length of a pin under forced convection heat transfer
Week 5	Report submission and discussion
Week 6	Find out the Heat Transfer Coefficient of vertical cylinder in natural convection.
Weeks 7-9	Study of Radiation heat transfer by black body and study the effect of hemisphere temperature on it
Weeks 10	Study the heat transfer phenomena in parallel / counter flow arrangements
Weeks 11-15	Report submission and discussion

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Heat Transfer a practical approach, Yunis A. Cengel 3rd Ed	yes
Recommended Texts	Fundamental of heat and mass transfer, Incropira, 7th Ed	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 Information معلومات المادة الدراسية					
Module Title	**Mechanical System Design &CAE**			**Module Delivery**	
Module Type	S			☒ **Theory** ☐ **Lecture** ☐ **Lab** ☐ **Tutorial** ☒ **Practical** ☐ **Seminar**	
Module Code	UOBAB0301064				
ECTS Credits	5				
SWL (hr/sem)	125				
Module Level	UGIII		**Semester of Delivery**	Six	
Administering Department	Type Dept. Code		**College**	Type College Code	
Module Leader	Ahmed Waleed Hussein		**e-mail**	msb.ahmed.waleed@uobabylon.edu.iq	
Module Leader's Acad. Title	Lecturer		**Module Leader's Qualification**	PhD	
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	Strength of Materials	**Semester**	2
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	**Objective 1:** To teach students how to apply the concepts of stress analysis, theories of failure and material science to analyze, design and/or select commonly used machine components. **Objective 2:** To illustrate to students the variety of mechanical components available and emphasize the need to continue learning. **Objective 3:** To teach students how to apply mechanical engineering design theory to identify and quantify machine elements in the design of commonly used mechanical systems. **Objective 4:** To teach students how to apply computer based techniques in the analysis, design and/or selection of machine components. **Objective 5:** Construct Prototypes and making simulations for various mechanical component using Solid works

Module Learning Outcomes مخرجات التعلم للمادة الدراسية	At the end of this subject, the students should be able to understand 1. To familiarize the various steps involved in the Design Process. 2. To understand the principals involved in evaluating the shape and dimensions of a component. 3. To satisfy functional and strength requirements of machine elements. 4. To learn to use standard practices and standard data. 5. To learn to use catalogues and standard machine components 6. To make simulation of various mechanical parts.
Indicative Contents المحتويات الإرشادية	**Indicative content includes the following**. 17 Features of flat belt drives, flat belt materials, flat belt 18 stresses and its specification, types of design factors, 19 design procedure (10 h) 20 Gears – Types of Gears, Gear Trains (10 h) 21 Gears - Force Analysis, Spur and Helical Gears, Bevel and Worm 22 Gears, Selection of Gears (5 h) 23 Mechanical Springs – Stresses and Deflection in Helical Springs, 24 Compression Springs, Stability, Spring Materials (10 h) 25 Rolling Contact Bearings and Lubrication – Bearing Types, Bearing 26 Life, Bearing Life, Rating Life, Selection of Bearings (10 h) 27 Clutches, Brakes, and Flywheels, Flexible Mechanical Elements (10 h) 28 Fasteners (10 h) 29 Simulations by solid works. (10 h)

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	79	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	5
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	46	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	3
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	5% (10)	5 and 10	LO #1 to #5
	Practice	1	10% (10)	Continuous	LO #6
	Report	1	5% (10)	6	LO #1 to #5
	Midterm Exam	4hr	30% (30)	7 and 13	LO #1 to #5
Summative assessment	**Final Exam**	3hr	50% (50)	16	LO #1 to #5
	100%				

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Belt Drive: Flat belt
Week 2	Belt Drive: V-belt
Week 3	Gears- Gear Tooth Theory
Week 4	Gears- Spur Gears
Week 5	Gears- Spur Gears, loading and stress, simulation using Solidworks
Week 6	Gears- Helical Gears
Week 7	Gears- Stresses in Helical Gears, simulation using Solidworks
Week 8	Bearings- Lubricants
Week 9	Bearings- Design of Hydrodynamic Bearings
Week 10	Bearings- Rolling-element bearings, simulation using Solidworks
Week 11	Spring design: compression springs, simulation using Solidworks
Week 12	Spring design: tension springs, simulation using Solidworks
Week 13	Spring design: torsional springs, simulation using Solidworks
Week 14	Clutches, simulation using Solidworks
Week 15	Brakes, simulation using Solidworks
Week 16	**Exam**

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Mechanical Engineering Design, J. Shigley, Eighth Edition,2008	Yes
Recommended Texts	Machine design: an Integrated approach, Norton,3rd edition, 2006	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 Information معلومات المادة الدراسية					
Module Title	**Electrical power systems**			**Module Delivery**	
Module Type	**S**			☒ **Theory** ☐ **Lecture** ☐ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	UOBAB0301065				
ECTS Credits	**4**				
SWL (hr/sem)	100				
Module Level	3		**Semester of Delivery**	2	
Administering Department	Type Dept. Code		**College**	Type College Code	
Module Leader	Ali Sabri Allw		**e-mail**	met.ali.sabry@uobabylon.edu.iq	
Module Leader's Acad. Title	Assist Professor		**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 Objectives أهداف المادة الدراسية	1) To develop problem solving skills and understanding of power generator. 2) To understand of power station. 3) To understand of Power transmission. 4) To understand of Emergency generators. 5) To understand distribution system configuration.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Understand the Electrical power generator 2. Recognize how power station. 3. Know and used Synchronous Generators. 4. Know the Power transmission. 5. Know the Emergency generators. 6. Know the distribution system configuration.
Indicative Contents المحتويات الإرشادية	**Indicative content includes the following.** • power generator, Structure of electrical power system, Location of power station, Power transmission [20 hrs] • Conductor materials, Mechanical design of transmission line, Emergency generators, Distribution system configuration. **[22 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 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	49	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	3
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	51	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	3
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% (20)	5 and 10	LO #3 - #6
	Lab.	1	10% (10)	Continuous	All
	Projects	1	10% (10)	10	LO #3, #5 and #5
Summative assessment	**Midterm Exam**	2hr	10% (10)	9	LO #1 - #4
	Final Exam	٣hr	50% (50)	16	All
Total assessment			100%		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Electrical power generator
Week 2	Structure of electrical power system
Week 3	Location of power station
Week 4	Load curve and factors
Week 5	Power transmission
Week 6	Conductor materials
Week 7	Parameter of overhead transmission line
Week 8	Mid-term Exam
Week 9	Mechanical design of transmission line
Week 10	Distribution inside large building
Week 11	Constructor defiles of 33/11kV & 11/0.4 kV distribution systems
Week 12	Emergency generators
Week 13	Uniterrubtiptible power system (UPS)
Week 14	Reactive power control in distribution network
Week 15	Distribution system configuration
Week 16	**Preparatory week before the final Exam**

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	• Electrical Power System / A.E. Guile, W. Paterson • Elements of power system analysis / William D. Stevenson , SR. • A course in electrical power . / M.L. Soni and P.V. Gupta	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 Information معلومات المادة الدراسية					
Module Title	Combustion Energy			**Module Delivery**	
Module Type	S			☒ **Theory** ☐ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	UOBAB0301066				
ECTS Credits	**5**				
SWL (hr/sem)	**125**				
Module Level	UGIII		**Semester of Delivery**	Six	
Administering Department	Type Dept. Code		**College**	Type College Code	
Module Leader	Fouad Abdul Ameer Khalaf		**e-mail**	msb.fouad.khalaf@uobabylon.edu.iq	
Module Leader's Acad. Title	Lecturer		**Module Leader's Qualification**	Ph.D.	
Module Tutor			**e-mail**		
Peer Reviewer Name	None		**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 Objectives أهداف المادة الدراسية	1) To study the fuel type, fuel classifications, fuel resources. 2) To study introduction for combustion science, thermodynamics of combustion. 3) Study the flames, alternative fuels and energy systems, burners design, gas turbine combustor design. 4) Study the combustion appliances-gas, burner-functional requirement of burner-gas, burner classification. 5) To study chemical reaction in combustion processes. 6) To study the emissions in combustion processes.

Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Explain the introduction to the fuel type and fuel combustion technology. 2. Relate between chemical kinetics of combustion, flames. 3. Classify fuel according to their types. 4. Describe basic definition of alternative fuels and energy systems. 5. Follow new developments in combustion appliances-gas, burner-functional requirement of burner-gas. 6. Give information about Chemical equation of combustion. 7. Define structure exhaust gas analysis. 8. Define Internal energy of combustion. 9. Calculate Enthalpy of formation. 10. Describe Calorific value of fuel. 11. Give information about Efficiency of combustion. 12. Chemical composition of pollutants. 13. Study the burner, gas turbine combustor design. 14. Give information about complete and incomplete combustion.
Indicative Contents المحتويات الإرشادية	**Indicative content includes the following.** • Introduction of engineering of combustion. and to understand classifications of fuel types. Also to learn structures of chemical equations of combustion and how to maximize the enthalpy of combustion with minimize the pollutants formation [20 hr]. • study the gas burner design, gas turbine combustor design with Effect of operation conditions on pollutants formation. [20 hr] • describe Calorific value of fuel. give information about Efficiency of combustion. Chemical composition of pollutants. give information about complete and incomplete combustion. [20 hr].

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	64	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	61	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	4
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 and 10	LO #1, #2 and #10, #11
	Assignments	2	10% (10)	2 and 12	LO #3, #4 and #6, #7
	Projects / Lab.	1	10% (10)	Continuous	All
	Report	1	10% (10)	13	LO #5, #8 and #10
Summative assessment	Midterm Exam	2hr	10% (10)	7	LO #1 - #7
	Final Exam	3hr	50% (50)	16	All
Total assessment			100%		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Fuels –Introduction, definition, classification, calorific value.
Week 2	Classifications of fuel types, Liquid fuel-Petroleum processing and fractions-manufacture.
Week 3	Calorific Value, Determination of calorific values.
Week 4	Theoretical calculation of calorific value of fuel.
Week 5	Solid Fuels, types, advantage and disadvantages. Liquid fuel, advantage, disadvantage.
Week 6	Combustion, classification of combustion, combustion of carbon, combustion of hydrocarbon.
Week 7	Chemical equation of combustion, complete and incomplete combustion.
Week 8	Air-fuel ratio.
Week 9	Exhaust gas analysis, Dissociation.
Week 10	Internal energy of combustion, enthalpy of combustion.
Week 11	Efficiency of combustion, introduction to pollution.
Week 12	Atmospheric burner design.
Week 13	Constant pressure combustion, Gas turbine combustor design.
Week 14	Constant volume combustion, IC engine combustion.
Week 15	Spark ignition engine, compression ignition engine pollutants.
Week 16	**Preparatory week before the final Exam**

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	Available in the Library?
Required Texts	Fuel, combustion and furnaces, by John Griswold. First edition Mc graw- Hill, 1946	Yes
Recommended Texts	An Introduction to combustion concept and application By Stephen R. Turns, second edition, Mc Graw – Hill, 2000	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.

UGIV – level
Semester – Seven

Module Information معلومات المادة الدراسية					
Module Title	**Control & Measurements in Energy Systems**			**Module Delivery**	
Module Type	C			☒ **Theory** ☐ **Lecture** ☒ **Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	UOBAB0301071				
ECTS Credits	**6**				
SWL (hr/sem)	**150**				
Module Level	UGIV		**Semester of Delivery**	Seven	
Administering Department	Type Dept. Code		**College**	Type College Code	
Module Leader	Hamid Hussain Hadwan		**e-mail**	met.hamed.huss@uobabylon.edu.iq	
Module Leader's Acad. Title	Master		**Module Leader's Qualification**	M.Sc	
Module Tutor			**e-mail**		
Peer Reviewer Name	None		**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	Fluid Mechanics	**Semester**	
Co-requisites module	Engineering Mechanics (Dynamics)	**Semester**	
Co-requisites module	Engineering Mechanics (Statics)	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	1- Describe units of measure and control systems. 2- Use measuring and control systems tools. 3- Explain purpose of measuring and control systems. 4- Describe methods of measuring and control systems 5-To use the techniques and skills for electrical projects and control systems. 6- Understand the Frequency Response Analysis using Nyquist Plots: Polar plots 7- Understand Stability Analysis 8- To understand Frequency Response Analysis 9- To understand Root locus plots 10- To study the Control Action 11- To study the Proportional Integral Derivative controllers 12- To learn Mathematical Representation 13- To understand Properties of Rotation Matrices 14- To understand Types of Joints and Links

Module Learning Outcomes مخرجات التعلم للمادة الدراسية	• Design a system, component or process to meet desired needs in electrical engineering. • Measurement of R,L,C ,Voltage, Current, Power factor , Power, Energy. • Ability to balance Bridges to find unknown values. • Ability to measure frequency, phase with Oscilloscope. • Ability to use Digital voltmeters • Explain the operation of a relay-based controller. • Understand the concept and purpose of a programmable logic controller (PLC). • Understand the hardware and wiring required in a PLC-based system. • List the steps that must be taken to make a PLC control system operational. • Understand the basic instructions used in a PLC program. • Differentiate the ways that a PLC can be programmed. • Understand how PLCs are used with networks. • Explain the purpose and operation of a motion controller.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. Standards of measurement: Definition and Objectives of metrology, Standards of length-International prototype meter, Imperial standard yard, Wave length standard, subdivision of standards, line and end standard, calibration of end bars (Numerical), Slip gauges, Wringing phenomena, Indian Standards (M-81, M-12), Numerical problems on building of slip gauges. [5 hrs] System of Limits, Fits, Tolerance and Gauging: Definition of tolerance, Specification in assembly, Principle of interchangeability and selective assembly limits of size [5 hrs] Comparators and Angular measurement: Introduction to comparators, characteristics, classification of comparators, mechanical comparators-Johnson Mikrokator, sigma comparators, dial indicator, optical comparators-principles, Zeiss Ultra optimeter, electric and electronic comparators-principles, LVDT, pneumatic comparators, back pressure gauges, solex comparators. [5 hrs] Angular measurements, bevel protractor, sine principle and use of sine bars, sine center, use of angle gauges (numerical on building of angles), clinometers. [5 hrs] Interferometer and screw thread, gear measurement: Interferometer, interferometry, autocollimator. Optical flats. Terminology of screw threads [5 hrs] Measurement of major diameter, minor diameter, pitch, angle and effective diameter of screw threads by 2-wire and 3-wire methods, best size wire. Toolmaker's microscope, gear.to. Terminology, use of gear tooth vernier caliper and micrometer. [5 hrs] Measurements and measurement systems: Definition, significance of measurement, generalized measurement system, definitions and concept of accuracy, precision, calibration, threshold, sensitivity, hysteresis, repeatability, linearity, loading effect. [5 hrs] System response-times delay. Errors in measurement, classification of errors. Transducers, transfer efficiency, primary. [5 hrs] Secondary transducers, electrical, mechanical, electronic transducers, advantages of each type transducers. [5 hrs] Frequency Response Analysis using Nyquist Plots: Polar plots [5 hrs] Nyquist Stability Criterion, Stability Analysis, Relative stability concepts [5 hrs]

	Mathematical Modeling: Transfer function, modeling of mechanical systems, electrical systems, elctromechanical systems, thermal systems, hydraulic and pneumatic systems, and Analogous systems: Force voltage, Force current. [5 hrs] Block Diagrams and Signal Flow Graphs: Block diagram representation, functional block, block diagram reduction, Signal flow graphs, and Mason's gain formula. [5 hrs] Transient and Steady State Response Analysis: Introduction, Standard test inputs, concept of time constant and its importance in speed of response, analysis of first order and second order systems, Transient response specifications, System stability analysis - Routh- Hurwitz Criterion. [5 hrs] Frequency Response Analysis using Bode Plots: Bode attenuation diagrams, Stability Analysis using Bode plots, and Simplified Bode Diagrams, phase and gain margin. [5 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	94	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	6
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	56	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	4
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 and 10	LO #1, #2 and #10, #11
	Assignments	2	10% (10)	2 and 12	LO #3, #4 and #6, #7
	Projects / Lab.	1	10% (10)	Continuous	All
	Report	1	10% (10)	13	LO #5, #8 and #10
Summative assessment	**Midterm Exam**	2hr	10% (10)	7	LO #1 - #7
	Final Exam	3hr	50% (50)	16	All
Total assessment			100%		

Delivery Plan (Weekly Syllabus)المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Standards of measurement: Definition and Objectives
Week 2	System of Limits, Fits, Tolerance and Gauging
Week 3	Comparators and Angular measurement
Week 4	Angular measurements.
Week 5	Interferometer and screw thread, gear measurement
Week 6	Measurement of major diameter, minor diameter, pitch, angle and effective diameter of screw threads
Week 7	**Midterm Exam** + UNIT-5: Measurements and measurement systems
Week 8	System response-times delay. Errors in measurement
Week 9	Definitions and concept of automatic controls, classification of control system.
Week 10	Open and closed loop systems
Week 11	Mathematical Modeling
Week 12	Block Diagrams and Signal Flow Graphs
Week 13	Transient and Steady State Response Analysis
Week 14	Frequency Response Analysis using Nyquist Plots
Week 15	Nyquist Stability Criterion, Stability Analysis, Relative stability concepts
Week 16	**Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Experiment 1: Calibration of Pressure Gauge
Week 2	Experiment 2: Calibration of Thermocouple
Weeks 3-4	Experiment 3: Calibration of Load cell
Week 5	Experiment 4: Determination of modulus of elasticity of a mild steel specimen using strain gauge
Week 6	None
Weeks 7-9	Experiment 5: Frequency Response of RC Energy Control Systems
Weeks 10	Experiment 6: Toolmaker Microscope
Weeks 11-15	Experiment 7: Determination of modulus of elasticity of a mild steel specimen using strain gauge

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	1. Mechanical Measurements, Beckwith Marangoni and Lienhard, Pearson Education, 6th Ed., 2006. 2. Modern Control Engineering, Katsuhiko Ogata, 5th Edition, Prentice Hall of India Pvt. Ltd., New Delhi 3. Engineering Metrology, I.C. Gupta, Dhapat Rai Publications, Delhi. 2. Mechanical Measurements, R.K. Jain	Yes

Recommended Texts	1. Industrial Instrumentation, Alsutko, Jerry. D. Faulk, Thompson Asia Pvt. 2002. 2. Engineering Metrology, I.C. Gupta, Dhapat Rai Publications, Delhi. 2. Mechanical Measurements, R.K. Jain	No
Websites	https://www.coursera.org/browse/physical-science-and-engineering/mechanical-engineering https://www.wolframalpha.com/examples/science-and-technology/engineering/control-systems 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 Information معلومات المادة الدراسية					
Module Title	**Solar & Wind Energy**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☐ **Lecture** ☒ **Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	UOBAB0301072				
ECTS Credits	**6**				
SWL (hr/sem)	١٥٠				
Module Level	UGIV		**Semester of Delivery**	Seven	
Administering Department	Type Dept. Code		**College**	Type College Code	
Module Leader	Ali Jaber Abdulhamed		**e-mail**	msb.ali.jaber@uobabylon.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 Objectives أهداف المادة الدراسية	1) To develop problem solving skills and understanding of solar radiation. 2) To understand of solar radiation. 3) To understand behavior of solar angles. 4) To understand behavior of solar radiation on horizontal & inclined surface. 5) To understand & solving problems in solar time. 6) To develop problem solving skills and understanding of design of solar collectors 7) To develop problem solving skills and understanding Photovoltaic cell . 8) To ability of design PV array. 9) To develop problem solving skills and understanding wind energy. 10) To ability of understanding design wind energy systems.

Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Know solar radiation. 2. Recognize & know what the solar angle. 3. Know & recognize what the solar time. 4. Know & recognize the solar collectors. 5. Know how to select the suitable solar collectors. 6. Know how to design solar collectors. 7. Know the behavior of PV cell. 8. Know how PV cell generate voltage. 9. Know how to design PV array. 10. Know & understand wind energy. 11. Know & understand how wind generator doing. 12. Know how to design of wind energy generator.
Indicative Contents المحتويات الإرشادية	**Indicative content includes the following**. • Introduction, Energy Classifications, Solar energy, solar radiation, the sun, Sun–Earth Geometric Relationship, Extraterrestrial Solar Radiation, Solar Constant, solar time, Local Solar Time, Latitude angle, Longitude Angle, The Sun Position, Solar altitude angle, Surface azimuth angle, Solar azimuth angle, Surface Slop, Angle of Incidence, Solar zenith angle, Hour angle, Solar declination angle, Sun-Path Diagram, Sunrise and sunset times, Translate Hour Angle to Hour Time, Solar radiation on horizontal surface, Air Mass Ratio, Beam Radiation, Diffuse Radiation, Total Solar Radiation, Solar radiation on inclined plane, reflected solar radiation, . **[25 hrs]** • Solar collector systems, solar energy Usage, Solar Collectors classifications, a) Design of Flat Plat collector (FPC) Parts of FPC, Type of FPC, Thermal Calculation of (FPC), Absorbed Energy in FPC, Useful Energy in FPC, FP. Collector Heat-Loss, Overall Heat-loss Coefficient in FPC, Heat removal factor in FPC, Collector Efficiency Factor of FPC, Fin Efficiency, Collector Efficiency, b) Ensign of Parabolic Trough collector. How did the idea of PTC start, receiver tube, Thermal Analysis of (PTC) Heat Removal Factor, Over-all heat loss coefficient, Collector Efficiency of PTC, Geometry analysis of a PTC, **[25 hrs]** • Photovoltaic panels (PV), PV Cell, Parts of solar cells, Material types of solar cell, Photovoltaic Technique, Bifacial & Nonofficial PV Module, Connecting of Solar Cell, Parameters of Solar Cell, Parts of Photovoltaic System Design of a PV System, **[20 hrs]** • Wind energy, Introduction, The wind, Power available in the wind spectra, Wind turbine power and torque, Classification of wind turbines, Horizontal axis wind turbines, Vertical axis wind turbines, Aerodynamics of wind turbines, Rotor design, Wind shear, Measurement of wind, Anemometers, Wind direction, Wind electric generators, Rotor, gear box, Power regulation, Safety brakes, Safety brakes, Wind farms, Offshore wind farms, Wind pumps. **[20 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 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	94	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	6
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	56	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	4
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	١٥٠		

Module Evaluation
تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	2	10% (20)	4 and 12	LO #1 - #9
	Project / Lab.	1	10% (10)	Continuous	All
	Report	1	10% (10)	11	LO #1- #11
Summative assessment	**Midterm Exam**	2hr	10% (10)	8	LO #1 - #6
	Final Exam	٣hr	50% (50)	16	All
Total assessment			100%		

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
Week 1	Solar radiation & solar time
Week 2	Solar angle
Week 3	Radiation on Horizontal and inclined plane
Week 4	Design of solar systems, Flat plate collector (FPC)
Week 5	Parabolic trough collector (PTC)
Week 6	Receiver tube in PTC
Week 7	Geometry analysis of PTC
Week 8	Mid-term Exam
Week 9	Photovoltaic Panels PV
Week 10	Design of PV array
Week 11	Basics of wind energy conversion
Week 12	Design of wind generator system, Aerodynamics of wind turbines
Week 13	Rotor design
Week 14	Measurement of wind
Week 15	Wind electric generators
Week 16	**Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: Light IV Characteristic Curve Of The Solar Module
Week 2	Lab 2: Dark IV Characteristic Curve Of The Solar Module
Week 3	Lab 3: Photocurrent as a Function Of Angle Incidence Of The Light Source.
Week 4	Lab 4: Photocurrent as a Function of the Distance of the Light Source
Week 5	Lab 5: Effect Of Solar Radiation On The Angle Of Tilt Experimentally
Week 6	Lab 6: Relationship between Solar Cell Efficiency And Cell Temperature

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts		Yes
Recommended Texts	Solar Engineering of Thermal Processes, Photovoltaic and Wind	No
Websites	http://ndl.ethernet.edu.et/bitstream/123456789/87792/1/A.Duffie%205th%20edition_compressed.pdf	

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	**Turbomachinery**			**Module Delivery**	
Module Type	**S**			☒ **Theory** ☐ **Lecture** ☐ **Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	UOBAB0301073				
ECTS Credits	**6**				
SWL (hr/sem)	**150**				
Module Level	UGIV		**Semester of Delivery**	Seven	
Administering Department	Type Dept. Code		**College**	Type College Code	
Module Leader	Aws Akram Mahmood		**e-mail**	Aws.al-akam@uobabylon.edu.iq	
Module Leader's Acad. Title	Lecturer		**Module Leader's Qualification**	PHD	
Module Tutor			**e-mail**		
Peer Reviewer Name	None		**e-mail**	E-mail	
Scientific Committee Approval Date			**Version Number**	1.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	Thermodynamics, Fluid Mechanics	**Semester**	2
Co-requisites module	NA	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	1- The students will be taught the definition and classification of turbomachinery (and fluid-machinery) according to various criteria, major types, and similarity relations. 2- A review for the relevant background will be implemented from related modules such as thermodynamics, fluid mechanics and Gas dynamics. 3- To enable the student to Use velocity vector triangles and 1D analysis to calculate the geometry, efficiency, and power for radial and axial turbomachines. 4- The students will be taught how to perform Dimensional analysis for a pump. 5- The calculation methods of the isentropic efficiencies of the nozzle diffuser and rotary machine will be delivered to the student. 6- A detailed study for the types of turbomachines will be taught to the students.

Module Learning Outcomes مخرجات التعلم للمادة الدراسية	At the end of the course the student will be able to …. 1) Analyze compressible flows and calculate relevant parameters; including stagnation, static and critical properties and Mach number. 2) classify the type of the rotary machines and define its components. 3) read the machinery characteristics curves and identify the operating point of the machine at design and off-design conditions. 4) identify the problems in the performance of the machines and suggest a solution to them, by understanding the behavior of the performance. 5) design and choose the appropriate rotating speed, mass flow, blade angle and pressure ratio for the turbomachinery and any operating conditions. 6) distinguish the faults in the rotary machine theoretically. 7) perform matching between the interconnect rotary machines (in gas turbine etc.) and ensure stabilized functionality.
Indicative Contents المحتويات الإرشادية	**Indicative content includes the following**: - Contact hours: 64 hrs. - Independent Study (preparation for course and review of materials): 70 hrs. - Independent Study (preparation for class test): 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 Reformulate complex engineering problems in order to solve them (simplifying assumptions, reducing complexity). Also, this may include a conceiving, plan and execute a research project, based on an analysis of its objectives, existing knowledge and the relevant literature. Correctly report on design results in the form of a technical report or in the form of a scientific paper. Present and defend results in a scientifically sound way, by performing seminars.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	64	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	5
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	86	**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

As		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	2	10% (10)	5 and 10	LO #1, #2 and #7
	Assignments	2	10% (10)	2 and 12	LO #3, #4 and #6, #7
	Projects / Lab.	NA	NA	NA	NA
	Report	1	10% (10)	13	LO #5, #8
Summative assessment	**Midterm Exam**	2hr	20% (10)	7	LO #1 - #7
	Final Exam	3hr	50% (50)	16	All
Total assessment			100%		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Definition and classification of turbomachinery (and fluid-machinery) according to various criteria. Major types of turbomachinery. Similarity relations
Week 2	**Review of relevant background** - Basic assumptions. - Continuity equation, linear and angular momentum theorems. - First and Second Laws of Thermodynamics. - Bernoulli equation for incompressible flow. - The stagnation state for incompressible and compressible flows.
Week 3	Dimensional analysis for the rotating machines I -Flow coefficient, head coefficient, power coefficient, efficiency, similar points, specific speed and specific diameter, Cordier curve. -Characteristic curves for pumps, System or load (pipeline) curve, operating point.
Week 4	Dimensional analysis for the rotating machines I - Operation at different speeds. - Operation of more than one pump in parallel and series
Week 5	**Isentropic efficiency definitions** - For nozzles and diffusers (stators). - For hydraulic turbines and pumps. - For thermal turbines and compressors. - Total/total versus total/static efficiency of a thermal turbine. - Polytropic efficiency of thermal turbines and compressors.
Week 6	**Work transfer in a turbomachine: Euler equation of turbomachinery** - Derivation of Euler equation and an alternative form. - Merging with the First Law of Thermodynamics: The Rothalpy equation and the Bernoulli equation.
Week 7	Midterm Exam
Week 8	**The Pelton wheel.** - Description - Detailed performance analysis.
Week 9	**Centrifugal pumps and fans** - Components - Velocity triangles, slip factor. - Theoretical head, actual head and hydraulic efficiency. - Various losses, overall efficiency.
Week 10	**Centrifugal compressors** - Inlet and outlet velocity triangles. - The *h-s* diagram of the compression process. - Total/total pressure ratio. - Maximum Mach numbers in the rotor and stator (diffuser).
Week 11	**Steam turbines** - Description and definition of a stage. - Detailed performance analysis.
Week 12	**Axial-flow gas turbines** - Description and definition of a stage. - Definition of performance parameters: Flow coefficient ϕ, stage loading coefficient ψ, stage reaction $^{\circ}R$, enthalpy loss factors λ_S and λ_R, total/total and total/static stage efficiencies η_{tt} and η_{ts}.

Week 13	**Axial-flow gas turbines** - Performance analysis (direct problem): Derivation of relationships for ψ, °*R*, η_{tt} and η_{ts}. - Indirect (or design) problem: Derivation of relationships for flow angles for specified ϕ, ψ and °*R* and sketching the stator and rotor blade rows. - Stage pressure ratio and maximum absolute and relative Mach numbers.
Week 14	**Operating conditions and system analysis.**
Week 15	**Turbine-Compressor Matching**
Week 16	**Preparatory week before the final Exam**

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Fluid Mechanics and Thermodynamics of Turbomachinery 7th Edition, Dixon and Hall, Elsevier Science & Technology, ISBN: 978-0-12- 415954-9.	No
Recommended Texts	1- Fluid Mechanics and Thermodynamics of Turbomachinery 7th Edition, Dixon and Hall, Elsevier Science & Technology, ISBN: 978-0-12- 415954-9. 2- Gas Turbine Theory 6th Ed, Saravanamuttoo, Rogers, Cohen and Straznicky, ISBN-10: 0132224372 . 3- Compressor aerodynamics, Cumpsty, Krieger Publishing Company, ISBN: 9781575242477 . 4- Mechanics of Fluids 7th ed., White, published by McGraw-Hill, ISBN13: 978-0077422417. 5- Thermodynamics: an Engineering Approach, YA Çengel and MA Boles, McGraw Hill	No
Websites	https://www.infobooks.org/free-pdf-books/engineering/fluid-mechanics/ https://www.academia.edu/20207960/Fluid_Mechanics_Textbook	

Grading Scheme
مخطط الدرجات

Group	Grade	التقدير	Marks %	Definition
Success Group (50 - 100)	**A** - Excellent	امتياز	90 - 100	Outstanding Performance
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	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	**Energy Management and Economics**			**Module Delivery**	
Module Type	C			☒ **Theory** ☐ **Lecture** ☐ **Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	UOBAB0301074				
ECTS Credits	٥				
SWL (hr/sem)	**125**				
Module Level	UGIV		**Semester of Delivery**	Seven	
Administering Department	Type Dept. Code		**College**	Type College Code	
Module Leader	Ahmed Reyadh Radhi		**e-mail**	met.ahmed.riadh@uobabylon.edu.iq	
Module Leader's Acad. Title	Lecturer		**Module Leader's Qualification**	Ph.D	
Module Tutor			**e-mail**		
Peer Reviewer Name	None		**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 Objectives أهداف المادة الدراسية	1- Introduction of Energy Management and Economics. and why it needed to study. In addition to understand classifications of Energy Management and Economics aspects. 2- The necessity of energy management concepts and scope of energy management at practical field. 3- The key economic concepts associated with the justification and evaluation of engineering projects and processes are introduced in this course. 4- Basics cost estimation, cash flow analysis, and profitability determination. 5- Introduction to Benefit Study, Plant Layout, Handling, Work and Time Study, Motion Study 6- Understanding of engineering management aspects that enable the engineer to operate the engineering projects successfully. 7- Introduction to decision supporting system modules that each engineer use it in engineering fields.

Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1- Getting knowledge of energy management, energy audit, and energy audit process 2- Introduction of energy use and distribution, billing rate structures, peak demand management, load factor, specific cost 3- Concepts related to energy conservation opportunities, energy measurements, energy information systems 4- Engineering project, project life cycle, reasons for project failure. 5- Financial management, financing energy management projects, financing categories, ,engineering economics, cash flow diagram. 6- Monitoring and controlling costs, material purchase control, labour cost control, suppliers or subcontractor cost control, equipment cost control, others cost. 7- Profit & contribution margin, engineering economic measures and principles, time value of money, interest rate (i), inflation. 8- Present worth and future worth, annual worth analysis, arithmetic gradient factors (G). 9- Calculation of project capital recovery, breakeven concept, and depreciation. 10- The network analysis, 11- Linear programming, 12- The inventory models 13- Transportation model 14- Total Quality, Management (TQM), Quality Control (Measurements and Specifications, Quality Concepts,, Economics Of Quality, Numerical Methods Of Quality Control
Indicative Contents المحتويات الإرشادية	**Indicative content includes the following**. • Getting knowledge of energy management, energy audit, and energy audit process, Introduction of energy use and distribution, billing rate structures, peak demand management, load factor, specific cost, Concepts related to energy conservation opportunities, energy measurements, energy information systems. Engineering project, project life cycle, reasons for project failure. Financial management, financing energy management projects, financing categories, ,engineering economics, cash flow diagram. [20 hr] • Monitoring and controlling costs, material purchase control, labour cost control, suppliers or subcontractor cost control, equipment cost control, others cost, project profit, profit equations. Profit & contribution margin equations, breakeven concept, engineering economic measures and principles, time value of money, interest rate (i), inflation. Present worth and future worth, annual worth analysis, arithmetic gradient factors (G). calculation of capital recovery. [20 hr] • The network analysis, Linear programming, The inventory models, Transportation model, Depreciation. [20 hr].

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	64	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	61	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	4
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)	3 and 15	LO #1, #2 and #10, #11
	Assignments	2	10% (10)	2 and 15	LO #3, #4 and #6, #7
	Projects / Lab.	1	10% (10)	Continuous	All
	Report	1	10% (10)	13	LO #5, #8 and #10
Summative assessment	**Midterm Exam**	2hr	10% (10)	7	LO #1 - #7
	Final Exam	3hr	50% (50)	16	All
Total assessment			100%		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Energy management principles.
Week 2	Energy use and distribution management.
Week 3	Energy conservation opportunities.
Week 4	Engineering project, project life cycle, reasons for project failure
Week 5	Financial management,
Week 6	Monitoring and controlling costs
Week 7	Profit & contribution margin
Week 8	engineering economic measures and principles
Week 9	Key economic factors
Week 10	**Midterm Exam**
Week 11	The network analysis
Week 12	Linear programming,
Week 13	The inventory models
Week 14	Transportation model
Week 15	TQM
Week 16	**Preparatory week before the final Exam**

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	1- Kanoğlu, M., & Çengel, Y. A. (2020). *Energy efficiency and management for engineers*. McGraw-Hill Education. 2- Doty, S., & Turner, W. C. (2004). *Energy management handbook*. Crc Press. 3- Operation Research, Hamdy Taha	No
Recommended Texts	ENGINEERING ECONOMY – Seventh Edition, Leland Blank , P. E., 2012	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 Information معلومات المادة الدراسية					
Module Title	**Energy and Environment**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☐ **Lecture** ☐ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	UOBAB0301075				
ECTS Credits	**4**				
SWL (hr/sem)	**100**				
Module Level	UGIV		**Semester of Delivery**	Seven	
Administering Department	Type Dept. Code		**College**	Type College Code	
Module Leader	Mohand Jaber Yasir		**e-mail**	msb.mohanad.yasir@uobabylon.edu.iq	
Module Leader's Acad. Title	Lecturer		**Module Leader's Qualification**	M.Sc.	
Module Tutor			**e-mail**		
Peer Reviewer Name	None		**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 Objectives أهداف المادة الدراسية	1) To study the fundamentals of environmental pollution and classification of it . 2) To understand the air pollution including its sources , effects , and how to control it 3) To study the solid wastes management including its sources , classification , and disposal of it . 4) To understand the water pollution including its sources , classification , effects , and how to control it . 5) To study the noise pollution including its sources and how to control it . 6) To study the natural and artificial lightning

Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1- Define environmental pollution and know about units of measurements. 2- Explain material balance and fundamentals of energy. 3- Classify the pollution. 4- Describe the air pollution and control methods. 5- Illustrate sources of air pollution and its effects. 6- Give information about sampling measurement and analysis of air pollutants. 7- Define and classify solid waste management. 8- Explain solid waste disposal options. 9- Manage the toxic wastes. 10-Describe the water pollution and its sources. 11-Classify water pollutants and their effects. 12-Give information about laws and standards of water pollution. 13-Illustrate the noise pollution and its sources. 14- Give information about methods of control of noise pollution. 15- Explain natural and artificial lightning.
Indicative Contents المحتويات الإرشادية	**Indicative content includes the following**. • Introduction of environmental pollution , SI units , basics of material balance , energy fundamentals , studying air pollution (sources , effects , control) [10 hr]. • Studying solid wastes management (sources , disposal options) , and water pollution (sources , effects , control , standards) [10 hr] • Studying noise pollution (sources , control) and natural & artificial lightning [10 hr].

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 quizes and by considering types of thoughts 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	34	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	66	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	4
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**100**		

Module Evaluation تقييم المادة الدراسية					
As		**Time/Number**	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	2	20% (20)	5 and 10	LO #1- #5 and #6 - #10
	Assignments				
	Projects / Lab.				
	Report	1	20% (20)	14	LO #11 - #14
Summative assessment	**Midterm Exam**	2hr	10% (10)	7	LO #1 - #7
	Final Exam	3hr	50% (50)	16	All
Total assessment			100%		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Introduction to environmental pollution
Week 2	Material balance and energy fundamentals
Week 3	Classification of pollution
Week 4	Air pollution and control methods
Week 5	Sources and effects of air pollutants
Week 6	Sampling measurement and analysis of air pollutants
Week 7	Solid wastes management – sources and classification - (Midterm Exam)
Week 8	Solid waste disposal options
Week 9	Toxic waste management
Week 10	Water pollution – sources o water pollutants
Week 11	Classification and effects of water pollutants
Week 12	Water pollution laws and standards
Week 13	Environment for comfort living and working
Week 14	Natural and artificial lightning
Week 15	Noise pollution
Week 16	**Preparatory week before the final Exam**

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Gilbert M. Masters , Introduction to Environmental Engineering and Science , Third Edition , 2014 .	Yes
Recommended Texts	Lee C. C. , Environmental Engineering Dictionary , Fourth Edition , 2005	No
Websites	www.sciencedirect.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.

UGIV – level
Semester – Eight

Module Information معلومات المادة الدراسية					
Module Title	**Power Plants**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☐ **Lecture** ☒ **Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	UOBAB0301081				
ECTS Credits	**6**				
SWL (hr/sem)	**150**				
Module Level	UGIV		**Semester of Delivery**	Eight	
Administering Department	Type Dept. Code		**College**	Type College Code	
Module Leader	Aws Akram Mahmood		**e-mail**	aws.al-akam@uobabylon.edu.iq	
Module Leader's Acad. Title	Lecturer		**Module Leader's Qualification**	PHD	
Module Tutor			**e-mail**		
Peer Reviewer Name	None		**e-mail**	E-mail	
Scientific Committee Approval Date			**Version Number**	1.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	Thermodynamics, Fluid Mechanics, Turbomachinery, heat transfer	**Semester**	2
Co-requisites module	NA	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	1) To study the power generation scenario, the components of thermal power plant, improved Rankin cycle, Cogeneration cycle. 2) To understand details of steam condensing plant, analysis of condenser, the environmental impacts of thermal power plant, method to reduce various pollution from thermal power plant. 3) To study layout, component details of hydroelectric power plant, hydrology and elements. 4) To understand components; layout of diesel power plant, components; different cycles ; methods to improve thermal efficiency of gas power plant 5) To understand components; layout of gas turbine power plant, components; different cycles; methods to improve thermal efficiency of the power plant. 6) To study the working principle, construction of power generation from non-conventional sources of energy such as gas turbine power plants 7) To learn the different instrumentation in power plant and basics of economics of power generation. 8) To lean the general Powerplant Maintenance

Module Learning Outcomes مخرجات التعلم للمادة الدراسية	At the end of the course the student will be able to …. 1. Describe the power generation scenario, the layout components of thermal power plant and analyze the improved Rankin cycle, Cogeneration cycle. 2. Analyze the steam condensers, recognize the environmental impacts of thermal power plant and method to control it. 3. Recognize the layout, component details of hydroelectric power plant gas turbine power plant. 4. Realize the details of diesel power plant, gas power plant and analyze gas turbine power cycle. 5. Emphasize the fundaments of non-conventional power plants. 6. Describe the different power plant electrical instruments and basic principles of economics of power generation. 7. Predict and suggest solution to the faults that would happens in the power plants
Indicative Contents المحتويات الإرشادية	**Indicative content includes the following**: - Contact hours: 64 hrs. - Independent Study (preparation for course and review of materials): 70 hrs. - Independent Study (preparation for class test): 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 Reformulate complex engineering problems in order to solve those (simplifying assumptions, reducing complexity). Also, this may include a conceiving, plan and execute a research project, based on an analysis of its objectives, existing knowledge and the relevant literature. Correctly report on design results in the form of a technical report or in the form of a scientific paper. Present and defend results in a scientifically sound way, by performing seminars.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	94	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	6
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	56	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	4
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 and 10	LO #1, #2 and #7
	Assignments	2	10% (10)	2 and 12	LO #3, #4 and #6, #7
	Projects / Lab.	4	10% (10)	Whole sem.	
	Report	1	10% (10)	13	LO #5, #8
Summative assessment	**Midterm Exam**	2hr	20% (10)	7	LO #1 - #7
	Final Exam	3hr	50% (50)	16	All
Total assessment			100%		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	**Introduction steam power plants Type of cycles**
Week 2	**Improving the efficiency of steam power plants Open feed water heater, Close feed water heater, Regenerative cycles**
Week 3	**Steam generators, Method of improving boilers performance**
Week 4	**Draught System**
Week 5	**Steam Condenser and Circulating Water Systems & cooling towers**
Week 6	**Gas Turbine components**
Week 7	**Construction and plant layout with auxiliaries**
Week 8	**Reheater and regenerators**
Week 9	**Combined cycle power plants and exam**
Week 10	**Power from Non-Conventional Sources**
Week 11	**Hydroelectric Power Plant**
Week 12	**Nuclear Power Plants**
Week 13	**Geothermal power plants**
Week 14	**Environmental Aspects of Power Station**
Week 15	**Instrumentation, equipment and maintenance in Power Station**
Week 16	**Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	**To study the boilers and their accessories and mountings**
Week 2	**To study the working of impulse and reaction steam turbines**
Weeks 3-4	**To prepare heat balance sheet for given boiler**
Week 5	**To find power output & efficiency of gas turbine**
Week 6	**To find power output & efficiency of a steam turbine**
Weeks 7-9	**Reports Submission and discussion**
Week 10	**To study cooling tower and find its efficiency**
Weeks 11-15	**Calibration of Thermometers and pressure gauges.**

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Power plants engineering, R. K 2015	No
Recommended Texts	6- Applied thermodynamics for engineering technologies, Eastop, 5th ED	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 Information معلومات المادة الدراسية					
Module Title	**Energy storage systems**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☐ **Lecture** ☒ **Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	UOBAB0301082				
ECTS Credits	**6**				
SWL (hr/sem)	١٥٠				
Module Level	UGIV	**Semester of Delivery**	Eight		
Administering Department	Type Dept. Code	**College**	Type College Code		
Module Leader	Watheq Naser Hussein	**e-mail**	met.watheq.naser@uobabylon.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	Heat Transfer	**Semester**	five
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	1.to get overview about the storage of energy 2.to learn how deal with thermal Energy storage 3.to learn about PCM using an means of energy storage 4.to learn about how to store energy in battery 5.to differentiate about the best way to store energy
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1) To learn the reasons of storing energy 2) To learn the types of storing energy and the differences among them 3) To learn how to apply physics in different fields especially those with practical nature. 4) To combine the lab with the theory 5) To understand how to make measurement in concern and how to deal with te arising problems. 6) To learn how to compare all types of storages and how to choose the best 7) To select the most powerful technique that could be used in Iraq practically 8) To learn how to solve and problem arising from any type theoretically. 9) To couple energy storage with other physics such as computer programming and economic considerations

Indicative Contents المحتويات الإرشادية	**Indicative content includes the following**. • Types of storages and thermal energy storage. **[20 hrs]** • Electrical storage and application, capacitors and batteries. **[15 hrs]** • Mechanical energy storage, CAES application and hydropower storage. **[15 hrs]** • Hydrogen as an energy carriers and how capture [5 hrs] • Energy storage in biofuel system [10 hrs] • Chemical storage and how to use new materials for storing . **[10 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 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	79	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	5
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	71	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	5
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	١٥٠		

Module Evaluation
تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	2	10% (20)	5 and 10	LO #1 - #5
	Lab.	1	10% (10)	Continuous	All
	Report	1	10% (10)	13	LO #6, #7 and #9
Summative assessment	**Midterm Exam**	2hr	10% (10)	7	LO #1 - #5
	Final Exam	٣hr	50% (50)	16	All
Total assessment			100%		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Introduction and difinition
Week 2	Thermal energy storage
Week 3	Thermal energy storage
Week 4	Thermal energy storage
Week 5	Hydroelectric storage
Week 6	Mechanical storage
Week 7	Mechanical storage
Week 8	Bioenergy storage

Week 9	Chemical energy storage
Week 10	Chemical energy storage
Week 11	Chemical energy storage
Week 12	Hydrogen energy storage
Week 13	Hydroelectric storage
Week 14	Materials in energy storage
Week 15	Comparisons of all type of energy storage
Week 16	**Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: Storage of energy using water
Week 2	Lab 2: Pcm as an Energy storage
Week 3	Lab 3: Capacitors and batteries
Week 4	Lab 4: Hydropower Energy storage
Week 5	Lab Exam

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Energy Production, Conversion, Storage, Conservation, and Coupling by Yasar Dimirel	no
Recommended Texts	Energy Storage: Systems and Components	no
Websites	https://www.taylorfrancis.com/books/mono/10.1201/b22265/energy-storage-alfred-rufer	

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	**Design of energy systems by computer**			**Module Delivery**	
Module Type	Core			☐ **Theory** ☒ **Lecture** ☐ **Lab** ☐ **Tutorial** ☒ **Practical** ☐ **Seminar**	
Module Code	UOBAB0301083				
ECTS Credits	**6**				
SWL (hr/sem)	**150**				
Module Level	UGIV		**Semester of Delivery**	Eight	
Administering Department	Type Dept. Code		**College**	Type College Code	
Module Leader	Ali Mohammed Ijam		**e-mail**	ali.ijam@uobabylon.edu.iq	
Module Leader's Acad. Title	Lecturer		**Module Leader's Qualification**	Ph.D.	
Module Tutor			**e-mail**		
Peer Reviewer Name	None		**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 Objectives أهداف المادة الدراسية	1) Establishing a basis for designing and developing sustainable energy systems. 2) Gain an understanding of how equations are derived and transformed into numerical representations. 3) Create visually appealing designs that can be used in a variety of situations by understanding the fundamental principles of design. 4) Demonstrate a solid understanding of energy systems and mathematical modeling. 5) Understand how solar photovoltaic (PV) systems work, and how they power appliances, lights, and other electrical devices. 6) Develop a deeper understanding of how to create models and choose the most effective strategy for solving the problem. 7) Learn how to select and design an appropriate energy system for an application with a computer. 8) Acquire a deep understanding of energy system performance through software prior to installation.

Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Understanding the basic concepts and definitions in any field of study. 2. Recognizing the energy systems that are necessary for designing and developing sustainable energy sources. 3. Having a solid knowledge of mathematical modeling associated with energy systems. 4. Being familiar with a solar PV system that can be designed to meet an individual's needs and energy requirements for years to come. 5. Being able to interpret the results and develop creative approaches to adjusting energy systems through design engineering principles. 6. Understanding the requirements, design principles, materials, and components and developing an efficient heat exchanger system. 7. Having the knowledge of how to design a solar energy-powered water heating system with the aid of a computer.
Indicative Contents المحتويات الإرشادية	**Indicative content includes the following**. • Some basic concepts and definitions about energy systems and definition of engineering design and analysis examples, how to create effective designs based on the fundamentals of design, what considerations need to be taken for a design, how different equations are applied to various problems, and how to properly discretize, introduce and design a PV system, the type of PV panels and how many panels are required, what is the size of the inverter and battery, and the type of electrical load to be supplied from the system. [25 hr] • Understand wind energy resources, and design systems by selecting the appropriate components, how to create battery thermal management systems that are efficient and reliable, utilizing the right material selection and configuration for batteries, how to effectively use modeling techniques to create meaningful results, how numerical methods are used to solve a variety of engineering problems, wind energy resources, and systems, selecting the appropriate components for the system. Having an in-depth understanding of thermal modeling for different energy systems. [25 hr] • Proper sizing and design of cooling equipment such as size and type to ensure maximum cooling efficiency, designing heat exchanger systems: fluid type, temperature, size, flow rate, and space available, designing solar water heating systems, amount of water required with available solar energy, what kind of energy storage is suitable, liquid or solid, external or internal, design and analysis. [25 hr]

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	This module is designed to encourage students to participate in the exercises, while simultaneously improving and expanding their critical thinking abilities. The exercises are designed to challenge and stimulate students, allowing them to become more confident in their abilities. Through these activities, students will be able to better apply their critical thinking skills to real-world situations. Classes, interactive tutorials, and simple experiments involving sampling activities that are interesting to students will be used to accomplish this goal. These activities will also help students develop effective problem-solving skills and creativity and they will be able to gain insights into their own potential and how to use it to their advantage.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	79	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	5
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	71	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	5
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 and 10	LO #1, #2 and #10, #11
	Assignments	2	10% (10)	2 and 12	LO #3, #4 and #6, #7
	Projects / Lab.	1	10% (10)	Continuous	All
	Report	1	10% (10)	13	LO #5, #8 and #10
Summative assessment	**Midterm Exam**	2hr	10% (10)	7	LO #1 - #7
	Final Exam	3hr	50% (50)	16	All
Total assessment			100%		

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
Week 1	Introduction to energy systems
Week 2	Basic considerations in design
Week 3	Governing equations and discretization methods
Week 4	Solar PV system design using MATLAB
Week 5	Solar PV system design using Simulink
Week 6	Developing wind power systems using MATLAB and Simulink I
Week 7	Developing wind power systems using MATLAB and Simulink II
Week 8	Thermal modeling
Week 9	Design battery thermal management systems using Simulink
Week 10	Design of cooling equipment
Week 11	Design of heat exchanger system I
Week 12	Design of heat exchanger system II
Week 13	Design of a solar energy driven water heating system
Week 14	Design of thermal energy storage system
Week 15	Revision and Project
Week 16	**Preparatory week before the final Exam**

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Hodge, B.K., & Taylor, R.P. (1999). Analysis and Design of Energy Systems (3rd ed.): Prentice Hall.	Yes
Recommended Texts	Jaluria, Y. (2007). Design and Optimization of Thermal Systems (2nd ed.): CRC Press.	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 Information معلومات المادة الدراسية					
Module Title	**Nuclear Energy**			**Module Delivery**	
Module Type	Core			☒ **Theory** ☐ **Lecture** ☐ **Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	UOBAB0301084				
ECTS Credits	**5**				
SWL (hr/sem)	**125**				
Module Level	UGIV		**Semester of Delivery**	Eight	
Administering Department	Type Dept. Code		**College**	Type College Code	
Module Leader	Mohand Jaber Yasir		**e-mail**	msb.mohanad.Yasir@uobabylon.edu.iq	
Module Leader's Acad. Title	Lecturer		**Module Leader's Qualification**	M.Sc.	
Module Tutor			**e-mail**		
Peer Reviewer Name	None		**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 Objectives أهداف المادة الدراسية	1) To study the fundamentals of nuclear energy and mechanism of nuclear fission 2) To understand the types of reactors and nuclear fuel cycles. 3) To study the types of nuclear fuels and spent fuel characteristics. 4) To understand the separation of reactor products and principles of isotopes separation 5) To study the wastes disposal and radiation protection. 6) To study the safety and pollution control.

Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1- Define nuclides, isotopes, and radioactivity. 2- Explain the nuclear reactions and mechanism of nuclear fission. 3- Classify the nuclear reactors. 4- Describe the design and construction of nuclear reactors. 5- Illustrate the reactor shielding. 6- Give information about nuclear fuel cycles. 7- Illustrate the production and purification of uranium. 8- Explain the other types of nuclear fuels. 9- Give information about spent fuel characteristics. 10-Describe the separation of reactor products. 11-Explain the fuel elements. 12-Give information about principles of isotopes separation. 13-Illustrate the wastes disposal. 14- Give information about safety and pollution control. 15- Explain the radiation hazards.
Indicative Contents المحتويات الإرشادية	**Indicative content includes the following**. • Introduction of nuclear energy, units, definition of isotopes, nuclides and radioactivity, types of nuclear reactors and constructions of them , studying the mechanism of nuclear fission . [15 hr]. • Studying the reactor materials , nuclear fuel cycles and production of uranium and other fuels [15 hr] • Studying the separation of reactor products , priciples of isotopes separation , and disposal of nuclear wastes . [15 hr].

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 quizzes and by considering types of thoughts 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	49	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	3
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	76	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	5
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	20% (20)	5 and 10	LO #1- #5 and #6 - #10
	Assignments				
	Projects / Lab.				
	Report	1	20% (20)	14	LO #11 - #14
Summative assessment	**Midterm Exam**	2hr	10% (10)	7	LO #1 - #7
	Final Exam	3hr	50% (50)	16	All
Total assessment			100%		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Introduction to nuclear energy
Week 2	Nuclear reactions and mechanism of nuclear fission
Week 3	Types of reactors and decay chains
Week 4	Constructions of nuclear reactors
Week 5	Reactor shielding
Week 6	Reactor materials and nuclear fuel cycles
Week 7	Production of uranium
Week 8	Other nuclear fuels
Week 9	Characteristics of spent fuel
Week 10	Separation of reactor products
Week 11	Fuel elements
Week 12	Principles of isotopes separation
Week 13	Wastes disposal and radiation protection
Week 14	Safety and pollution control
Week 15	Radiation hazards
Week 16	**Preparatory week before the final Exam**

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	John R. Lamarsh , Introduction to Nuclear Engineering , Third Edition , 2006 .	Yes
Recommended Texts	Luis E. Echavarri , Nuclear Energy Today , Second Edition , 2019 .	No
Websites	www.iaea.org	

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks %**	**Definition**
Success Group (50 - 100)	**A** - Excellent	امتياز	90 - 100	Outstanding Performance
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