قسم هندسة الليزر والالكترونيات البصرية

تم استحداث القسم مع بدء العام الدراسي 1994-1995 في كلية الهندسة. يساهم القسم في الريادة في التعليم الهندسي في اختصاص هندسه الليزر والالكترونيات البصرية.

رؤية القسم

رؤية القسم هي أن يكون مؤسسة رائدة في البحث والتعليم في هندسة الليزر والضوئيات، من خلال تخريج طلاب مؤهلين بشكل جيد لدخول سوق العمل أو مواصلة التعليم العالي، والمساهمة في تقدم هذا المجال من خلال الأبحاث المتطورة والابتكار.

رسالة القسم

اعداد كوادر هندسية على مستوى عال قادرة على حل المشاكل الصناعية والتصميمية وانجاز البحوث العلمية والهندسية. اضافة الى الاهتمام بمشاريع البحوث العلمية الاساسية والتطبيقية بصورة خاصة التي تواكب المستجدات العلمية والتكنولوجية. التاكيد على تخريج دفعات ذو نوعية وكفاءة عاليتين.

أهداف القسم

1. تمكين خريجي البرنامج من ممارسة المهنة الهندسية بكفاءة، وتطبيق تقنيات الليزر والإلكترونيات البصرية في المجالات الطبية والصناعية والاتصالات.
2. إعداد خريجين قادرين على الإسهام في البحث العلمي والتطوير والابتكار، أو مواصلة دراساتهم العليا بنجاح في المجالات ذات الصلة.
3. تنمية مهارات القيادة والعمل الجماعي لدى الخريجين، وتعزيز التزامهم بأخلاقيات المهنة والمسؤولية المهنية في بيئات العمل الهندسية.
4. تعزيز التعاون متعدد التخصصات بين طلبة الدراسات العليا وأعضاء هيئة التدريس والقطاع الصناعي لدعم التطوير البحثي وتطوير ابتكارات متقدمة في هندسة الليزر والإلكترونيات البصرية بما يلبي احتياجات المجتمع وسوق العمل.

مع بداية العام الدراسي 2025–2024، باشر قسم هندسة الليزر والإلكترونيات البصرية، وفقًا لتوجيهات وزارة التعليم العالي والبحث العلمي، بتطبيق نظام مسار بولونيا (Bologna Process)، الذي يُعدّ من أبرز المبادرات الرامية إلى تطوير منظومة التعليم العالي والارتقاء بجودتها .ويهدف هذا النظام إلى تعزيز التعاون والتكامل بين الهيئات الحكومية والجامعات والمؤسسات التعليمية والتدريسيين والطلبة، فضلًا عن مؤسسات سوق العمل ومجالس ضمان الجودة والمنظمات الدولية، بما يسهم في تحسين مخرجات التعليم العالي، وتطوير كفاءات الطلبة، وتحقيق المواءمة بين البرامج الأكاديمية ومتطلبات سوق العمل، وضمان استدامة جودة التعليم والتطوير المستمر.

الكادر التدريسي:

ت	الاسم مع القب العلمي	الشهادة الحاصل عليها	الاختصاص العام	الاختصاص الدقيق
1	أ.د. احمد كمال احمد	دكتوراه	علوم فيزياء	بصريات الالكترون
2	أ.د. بسام غالب رشيد	دكتوراه	علوم فيزياء	ليزر/نانوتكنلوجي
3	أ.د. شيماء رياض محمدعلي	دكتوراه	هندسة الليزر والالكترونيات البصرية	ليزر/الكترونيك واتصالات
4	أ.م.د. علي عدنان خليل	دكتوراه	هندسة الليزر والالكترونيات البصرية	تصوير ليزري
5	أ.م.د.محمد فوزي محمد كاظم	دكتوراه	هندسة الليزر والالكترونيات البصرية	تطبيقات الليزر
6	أ.م.د.انوار عبد الستار عبد الرزاق	دكتوراه	هندسة الليزر والالكترونيات البصرية	الكترونيات بصرية
7	أ.م.د.تغريد خالد حمد	دكتوراه	علوم فيزياء	اطياف
8	أ.م.د. احمد رياض عباس	دكتوراه	هندسة ميكانيكية	تطبيقات الليزر
9	أ.م.د.فاطمة حامد رجب	دكتوراه	هندسة الليزر والالكترونيات البصرية	تطبيقات الليزر
10	أ.م.د.انسام ماجد سلمان	دكتوراه	هندسة الليزر والالكترونيات البصرية	ليزر/الكترونيك واتصالات
11	أ.م.د مروة علي زيدان	دكتوراه	هندسة الليزر والالكترونيات البصرية	تطبيقات الليزر
12	أ.م.د. ورود عبد الخالق خليل	دكتوراه	هندسة الليزر والالكترونيات البصرية	ليزر/الكترونيك واتصالات
13	أ.م.د. دينا يعقوب متي	دكتوراه	هندسة الليزر والالكترونيات البصرية	تصاميم الليزر وتطبيقاته
14	أ.م.د. رنا محمد طه	دكتوراه	هندسة الليزر والالكترونيات البصرية	ليزر/الكترونيك واتصالات
15	م.د. الهدى عبد الحسين عويد	دكتوراه	هندسة الليزر والالكترونيات البصرية	ليزر/الكترونيك واتصالات
16	م.د.رشا خالد محمد	دكتوراه	هندسة الليزر والالكترونيات البصرية	الكترونيك واتصالات بصرية
17	م.د.لمى زهير محمد	دكتوراه	هندسة الليزر والالكترونيات البصرية	هندسة ليزر
18	م.د.شهد عماد يونس	دكتوراه	هندسة الليزر والالكترونيات البصرية	هندسة ليزر
19	م.د. رشا هاشم مهدي	دكتوراه	هندسة الليزر والالكترونيات البصرية	ليزر/الكترونيك واتصالات
20	م. جلال عبد الله خلف	ماجستير	هندسة الالكترونيك والاتصالات	تطبيقات الليزر
21	م. اسماء كمال عبد الغني	ماجستير	لغة عربية	ادب
22	م.م. اسراء نجاتي اكرم	ماجستير	هندسة الليزر والالكترونيات البصرية	هندسة الليزر والالكترونيات البصرية
23	م.م. الاء سهام حامد	ماجستير	هندسة كهروميكانيك	هندسة كهروميكانيك
24	م.م. أنمار خليل انجاد	ماجستير	هندسة الليزر والالكترونيات البصرية	هندسة الليزر والالكترونيات البصرية
25	م.م. نور فاخر خدر	ماجستير	علوم فيزياء	
26	م.م.مآب حافظ توفيق	ماجستير	هندسة الليزر والالكترونيات البصرية	هندسة الليزر والالكترونيات البصرية
27	م.م. سارة غسان	ماجستير	هندسة اتصالات	هندسة اتصالات

Republic of Iraq - Ministry of Higher Education and Scientific Research

Al-Nahrain University

Bachelor's Degree in Laser and Optoelectronics Engineering

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Program Curriculum (2025 - 2026)

جمهورية العراق - وزارة التعليم العالي والبحث العلمي

جامعة النهرين

بكالوريوس في هندسة الليزر و الالكترونيات البصرية

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

المنهاج الدراسي للعام 2025-2026

Level	Sem.	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)	ect (hr/w)	Lab (hr/w)	Pr (hr/w)	Tut (hr/w)	semn (hr/w							
FIRST YEAR	One	1	URDEM	Democracy and Human Rights	الديمقراطية وحقوق الانسان	Arabic	2						3	33	17	50	2.00	B	
		2	URCOM	Computer	حاسوب	English	2		2				3	63	12	75	3.00	B	
		3	CERDRW	Engineering Drawing	الرسم الهندسي	English	2			4			3	93	32	125	5.00	B	
		4	PHYS110	Physics	الفيزياء	English	2		2				3	63	62	125	5.00	B	
		5	CERMAT1	Mathematics	الرياضيات	English	5						3	78	47	125	5.00	B	
		6	LAER110	DC Electrical Circuits	دوائر كهربائية التيار المستمر	English	4		2				3	93	82	175	7.00	C	
		7	LAER111	Laser Sciences	علوم الليزر	English	2						3	33	42	75	3.00	C	
						Total	19	0	6	4	0	0	21	456	294	750	30		

Level	Sem.	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)	ect (hr/w)	Lab (hr/w)	Pr (hr/w)	Tut (hr/w)	semn (hr/w							
FIRST YEAR	Two	1	URENG1	English Language	اللغة الانكليزية	English	2						3	33	17	50	2.00	B	
		2	URARA	Arabic Language	اللغة العربية	Arabic	2						3	33	17	50	2.00	B	
		3	CERMAT2	Fundamentals of Engineering Mathematics	اساسيات الرياضيات الهندسية	English	5						3	78	47	125	5.00	B	
		4	LAER120	AC Electrical Circuits	دوائر كهربائية التيار المتناوب	English	4		3				3	108	67	175	7.00	C	
		5	LAER121	Geometrical Optics	بصريات هندسية	English	2		2				3	63	87	150	6.00	C	
		6	LAER122	Engineering Mechanics	الميكانيك الهندسي	English	4		2				3	93	57	150	6.00	C	
		7	CERWOR	Workshop	الورش	Arabic				2			3	33	17	50	2.00	S	
						Total	19	0	7	2	0	0	21	441	309	750	30.00		

Level	Sem.	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)	ect (hr/w)	Lab (hr/w)	Pr (hr/w)	Tut (hr/w)	semn (hr/w							
SECOND YEAR	Three	1	URBRC	Ba'ath Regime Crimes	جرائم نظام البعث في العراق	Arabic	2						3	33	17	50	2.00	B	
		2	URARA2	Arabic Language 2	اللغة العربية 2	Arabic	2						3	33	17	50	2.00	B	
		3	URENG2	New Headway Plus Pre-Intermediate	مادة اللغة الانكليزية	English	2						3	33	17	50	2.00	B	
		4	CERMAT3	Engineering Mathematics	الرياضيات الهندسية	English	5						3	78	47	125	5.00	B	
		5	LAER210	Fundamentals of Electronic Devices	اساسيات الاجهزة الالكترونية	English	3		3		1		3	108	67	175	7.00	C	LAER120
		6	LAER211	Electromagnetic Fields	مجالات كهرومغناطيسية	English	4				2		3	93	57	150	6.00	C	
		7	LAER212	Optical Materials	المواد البصرية	English	4		2				3	93	57	150	6.00	C	
						Total	22	0	5	0	3	0	21	471	279	750	30.00		

Sem.	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)	ect (hr/w)	Lab (hr/w)	Pr (hr/w)	Tut (hr/w)	semn (hr/w							
Four	1	URCOM2	Computer 2	الحاسوب 2	English	2		2				3	63	12	75	3.00	B	
	2	CERMNG	Principles of Management	مبادئ الادارة	Arabic	2						3	33	17	50	2.00	B	
	3	CERMAT4	Analytic Mathematics	الرياضيات التحليلية	English	5						3	78	47	125	5.00	B	
	4	LAER220	Electronic Circuits	الدوائر الالكترونية	English	2		3		1		3	93	57	150	6.00	C	LAER120
	5	LAER221	Digital Combinational Systems	الانظمة التوافقية الرقمية	English	2		3		1		3	93	57	150	6.00	C	
	6	LAER222	Laser Physics	فيزياء الليزر	English	2		2		1		3	78	72	150	6.00	B	
	7	LAER223	Laser Safety	الوقاية من الليزر	English	2						3	33	17	50	2.00	C	
					Total	17	0	10	0	3	0	21	471	279	750	30.00		

Level	Sem.	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/se...	ECTS	Module Type	Prerequisite Module(s) Code
							CL (hr/w	ect (hr/w	Lab (hr/w	Pr (hr/w)	Tut (hr/w)	emn (hr/w							
THIRD YEAR	Five	1	CERMAT5	Engineering and Numerical Analysis	التحليلات الهندسية والعددية	English	5						3	78	47	125	5.00	B	CERMAT1
		2	LAER310	Quantum Technologies	التقنيات الكمية	English	2				1		3	48	52	100	4.00	C	
		3	LAER311	Optoelectronics	الالكترونيات البصرية	English	2						3	33	67	100	4.00	C	
		4	LAER312	Digital Sequential Systems	الانظمة التسلسلية الرقمية	English	3		3		1		3	108	67	175	7.00	C	LAER221
		5	LAER313	Industrial Laser Applications	تطبيقات الليزر الصناعية	English	3		2		1		3	93	82	175	7.00	C	
		6	LAER314	Wave Propagation	انتشار الموجات	English	2				1		3	48	27	75	3.00	C	LAER211
						Total	17	0	5	0	4	0	18	408	342	750	30.00		
	Sem.	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/se...	ECTS	Module Type	Prerequisite Module(s) Code
							CL (hr/w	ect (hr/w	Lab (hr/w	Pr (hr/w)	Tut (hr/w)	emn (hr/w							
	Six	1	LAER320	Laser in Medicine	الليزر في الطب	English	3						3	48	52	100	4.00	C	
		2	LAER321	Spectroscopy	الأطياف	English	2		2				3	63	37	100	4.00	C	
		3	LAER322	Optical Systems Design	تصميم المنظومات البصرية	English	2		2				3	63	62	125	5.00	C	LAER121
		4	LAER323	Communications Theory and Networks	نظرية الاتصالات والشبكات	English	4				2		3	93	82	175	7.00	C	
		5	LAER324	Computer Architecture	معمارية الحاسوب	English	4		4				3	123	52	175	7.00	C	
		6	CERSTA	Statistics and Probability	الاحصاء والاحتمالية	English	3						3	48	27	75	3.00	B	
		7	TRAN#90	Summer Training	التدريب الصيفي														
						Total	18	0	8	0	2	0	18	438	312	750	30.00		
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/se...	ECTS	Module Type	Prerequisite Module(s) Code
							CL (hr/w	ect (hr/w	Lab (hr/w	Pr (hr/w)	Tut (hr/w)	emn (hr/w							
FORTH YEAR	Seven	1	CERPRO1	Project 1	مشروع 1	English				2			3	33	67	100	4.00	C	
		2	URPET	Professional Ethics	اخلاقيات المهنة	Arabic	1						3	18	7	25	1.00	B	
		3	LAER410	Laser Detection Systems	منظومات الكواشف الليزرية	English	2		2		1		3	78	97	175	7.00	C	LAER120
		4	LAER411	Control Theory	نظرية السيطرة	English	2		2		1		3	78	97	175	7.00	C	LAER210,220
		5	LAER412	Optical Fibers	الألياف البصرية	English	2		2		1		3	78	97	175	7.00	C	
		6	LAER413	Elective I	مادة اختيارية I	English	2						3	33	67	100	4.00	E	
						Total	9	0	6	2	3	0	18	318	432	750	30.00		
	Sem.	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/se...	ECTS	Module Type	Prerequisite Module(s) Code
							CL (hr/w	ect (hr/w	Lab (hr/w	Pr (hr/w)	Tut (hr/w)	emn (hr/w							
	Eight	1	CERPRO2	Project 2	مشروع 2	English				2			3	33	67	100	4.00	C	
		2	LAER420	Laser Design Technology	تكنولوجيا تصاميم الليزر	English	2		3		1		3	93	82	175	7.00	C	LAER222
		3	LAER421	Digital Image Processing	معالجة الصور الرقمية	English	2		2		1		3	78	22	100	4.00	C	
		4	LAER422	Intelligent Control Engineering	هندسة السيطرة الذكية	English	3		2		1		3	93	32	125	5.00	C	LAER210,220
		5	LAER423	Optical Communications	الاتصالات البصرية	English	2		2				3	63	87	150	6.00	C	LAER323
		6	LAER424	Elective II	مادة اختيارية II	English	2						3	33	67	100	4.00	E	
						Total	11	0	9	2	3	0	18	393	357	750	30.00		
						Total	132	0	56	10	18	0	156	3396	2604	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			SWL:	Student Workload
	CL	Class Lecture		B	Basic learning activities	SSWL:	Structured SWL
	Lab	Laboratory		C	Core learning activity	USSWL:	Unstructured SWL
	Pr	Practical Training		S	uport or related learning activit		
	Tut	Tutorial		E	Elective learning activity		
	Lect	Online lecture					
	Sem	Seminar					

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

MODULE DESCRIPTION FORM
نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	Democracy and Human Rights			**Module Delivery**	
Module Type	Basic			☒ **Theory** ☐ **Lecture** ☐ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	URDEM				
ECTS Credits	2				
SWL (hr/sem)	50				
Module Level	UGx11 1		**Semester of Delivery**	1	
Administering Department	Type Dept. Code		**College**	Type College Code	
Module Leader	Inas Abdualameer Abbood		**e-mail**	inas.a.abbood@nahrainuniv.edu.iq	
Module Leader's Acad. Title	Assist.Lect.		**Module Leader's Qualification**		
Module Tutor	Ban		**e-mail**		
Peer Reviewer Name			**e-mail**		
Scientific Committee Approval Date	01/06/2023		**Version Number**	2.0	

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

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	1. To understand rights and freedoms 2. To Learn about children's rights 3. To Understanding the meaning of democracy, its types and its historical development until the present time 4. To Interested in the student's knowledge of democracy well, and the difference between it and freedom

	5. To know the elections, their role and importance, and the role of the voter's voice 6. To Knowledge of democratic systems practiced by countries 7. To Recognizing the meaning of integrity and combating corruption in the system
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Developing cognitive skills To understand rights and freedoms, democracy and its types, stages of development of democracy and its importance Developing 2. Learning the rights of the child 3. Gaining the skill, experience and knowledge to perform the elections and their importance 4. understand pseudo-democracy and be able to know the meaning of democracy and its difference from freedom Performing 5. Understand Types of democracy used and the best and the reason for its use 6. Understanding Elections, methods and requirements 7. Knowing the meaning of integrity and combating corruption in the system 8. Develop the student's ability to dialogue and discussion
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. Basic concepts of rights and freedoms and their types [2 hours] Child rights in legislation and Islam [2 hours]The roots of the concept of democracy and its development [2 hours],Elements, Requirements, and Environment of Democracy T [3 hours],The importance of elections Knowledge of its systems, terminology and application [3 hours],Recognizing the importance of the democratic system [1 hour] Objection and how to implement it [2 hours], Prepare a report[1 hour], Presentation on integrity and preservation of public money[2 hours]

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The main strategy that will be adopted in presenting this unit is to develop students' skills in research and familiarity with the concept of freedom and democracy, how to perform elections, the importance of one's voice, integrity, transparency, and the preservation of public money. Have the students present different topics via homework.

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	1.1
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	50		

Module Evaluation
تقييم المادة الدراسية

As		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	2	10% (5)	3,5	LO #1,2,3 and 5,6,7
	Onsite Assignments	1	10% (10)	Continuous	all
	Reports	2	10% (5)	4, 8	all
	project	1	10% (10)	8	LO # 1 to 7
Summative assessment	**Midterm Exam**	2 hr	10% (10)	7	LO # 1,7,8 to 12
	Final Exam	hr3	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

Week	Material Covered
Week 1	مفهوم حقوق الانسان
Week 2	حقوق في الحضارات القديمة
Week 3	حقوق الانسان في الشرائع والاديان السماوية
Week 4	مصادر حقوق الانسان
Week 5	ضمانات حقوق الانسان ووسائل حمايتها
Week 6	دور المنظمات في حماية حقوقالانسان العولمة وحقوق الانسان
Week 7	امتحان نصف فصلي
Week 8	مفهوم الديمقراطية
Week 9	الديمقراطية التمثيلية
Week 10	مفهوم الانتخاب وتكيفه القانوني
Week 11	تنظيم عملية الانتخاب
Week 12	نظم الانتخاب
Week 13	مقومات ومعوقات الحكم الرشيد (الحكم الصالح(
Week 14	تكوين هيئة الناخب
Week 15	مميزات وعيوب الديمقراطية
Week 16	**Preparatory week before the final Exam**

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

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	National Center for Human Rights and Democracy (Iraq Ministry of Human Rights Research Department 2013) Political systems / Dr. Hamid Hanoun Khaled Human rights between text and application Dr. Ali Shukry The Interim State Administration Law of 2004 and the permanent Iraqi constitution of 2005 Human rights and democracy Prepared by a.m.d. Ghassan Karim Majthab, a.m. Amjad Zine El Abidine Tohme Jamil Hamdawi, Education and Democracy, Diwan Al Arab - http://www.diwanalarab.com	No
Recommended Texts	Dr. Maher Sabry Kazem Human Rights, Democracy and Public Freedoms (Baghdad 2010)	No
Websites	https://www.statistics	

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks (%)**	**Definition**
Success Group (50 - 100)	**A -** Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria

Fail Group (0 – 49)	**FX –** Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

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

MODULE DESCRIPTION FORM
نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	Computer			**Module Delivery**	
Module Type	Basic			☒ **Theory** ☐ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	URCOM				
ECTS Credits	3				
SWL (hr/sem)	75				
Module Level	1		**Semester of Delivery**	1	
Administering Department	Laser		**College**	engineering	
Module Leader	luma Zuhair mohammed		**e-mail**	lumazuhair@nahrainuniv.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	01/06/2024		**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 computer programming through the application of techniques. 2. To understand the programming by computer to solve any problem. 3. This course deals with the basic concept of computer and its applications. 4. This is the basic subject for all programing language. 5. To understand and work with Microsoft office (word, power point, excel) and its applications program. 6. To understand and work with basic of network, Internet, search engine and E-mail.

Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Recognize how computer works. 2. List the various types of computer and its history. 3. Summarize what is meant by operating system. 4. Discuss the type of operating system. 5. Describe windows 7 and how to work with. 6. Deal with Microsoft applications. 7. Work and applied the Microsoft office word 2010, power point 2010 and excel 2010. 8. Define and understand network, internet, search engine and E-mail.
Indicative Contents المحتويات الإرشادية	Part A – computer fundamentals and its applications Basic of computer- history of computer, properties of computer, fields of computer, structure of computer, data and information, bit and byte, bios, operating system, computer security and privacy, electronic intrusion, virus, damage computer health, operating system, types of operation system, windows 7, work with windows 7 in details. Part B – Microsoft office applications Work with Microsoft office word 2010, Microsoft office power point 2010, Microsoft office excel 2010 in details. Part C – Network, Internet and E-mail Explain basic of network and internet, work with the browsing and searching the internet, E-mail and E-chatting, and the ethic of internet word.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The main strategy of this module is to learn and work with computers and their applications in class and laboratory. By studying and applying computer (hardware and software) and dealing with Microsoft Office 2010 (Word, PowerPoint, Excel) which is a powerful tool that is used in work. Finally, the network, internet, and E-mail which is necessary to deal with in our life. All these can be easy and interesting to learn and use by applying them in the laboratory, which makes a good student in skills of computers and the Internet.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	63	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	12	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	0.8
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**75**		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	3	16% (10)	Continuous	All
	Home work	3	9.6% (10)	Continuous	All
	Report	2	9.6% (10)	Continuous	All
	Seminar and project	2	1.6 % (5)	Continuous	All
	Lab. Exam.	1	3.2% (10)	Continuous	All
Summative assessment	**Midterm Exam**	2hr	10% (10)	4, 11, 15	All
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Introduction to Computer: Concepts of Hardware and Software with their components; Concept of Computing, Data and Information; Applications of Information Electronics and CommunicationTechnology (IECT);Connecting input/output devices, and peripherals to CPU
Week 2	Computer Components: Computer Portions, Hardware Parts, 1/0 Units, Memory Types, Basic Components, Computer Ports, Personal Computer, Personal Computer (Features and Types)
Week 3	Operating System and Graphical User Interface GUI: Operating System; Basics of Common Operating Systems; User Interface, Using Mouse Techniques; Use of Common Icons, Status Bar, Using Menu and Menu-selection, Concept of Folders and Directories, Opening and closing of different Windows; Creating Short cuts
Week 4	Word:Processing: Word Processing Basics;Opening and Closing of documents; Text creation and Manipulation; Formatting of text; Table handling;Spell check, language setting and thesaurus Printing of word document
Week 5	Presentation Software:Basics of presentation software; Creating Presentation: Preparation and Presentation of Slides; Slide Show;Taking printouts of presentation / handouts
Week 6	Introduction to Internet and Web Browsers:Computer networks Basic; LAN, WAN; Concept of Internet and its Applications; connecting to internet;World Wide Web; Web Browsing software's, Search Engines; Understanding URL; Domain name; IP Address
Week 7	Communications and Emails: Basics of electronic mail; Getting an email account; Sending and receiving emails: Accessing sent emails; Using Emails; Document collaboration
Week 8	Communications and Emails: Basics of electronic mail; Getting an email account; Sending and receiving emails: Accessing sent emails; Using Emails; Document collaboration
Week 9	Mid exam

Week 10	Computer Troubleshooting: Identifying and solving common hardware and software problems that computer users encounter. Basic, troubleshooting techniques and tools for diagnosing and resolving Issues
Week 11	Simenar
Week 12	Computer Troubleshooting: Identifying and solving common hardware and software problems that computer users encounter. Basic, troubleshooting techniques and tools for diagnosing and resolving Issues
Week 13	Computer Troubleshooting: Identifying and solving common hardware and software problems that computer users encounter. Basic, troubleshooting techniques and tools for diagnosing and resolving Issues
Week 14	Project
Week 15	**Preparatory week before the final Exam**
Week 16	**Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: Computer Hardwar
Week 2	Lab 2: Computer software and operating system
Week 3	Lab 3: Windows 7
Week 4	Lab 4: Windows 7 continue
Week 5	Lab 5: Microsoft office Word 2010
Week 6	Lab 6: Microsoft office Word 2010 continue ...
Week 7	Lab 7: Microsoft office Power point 2010
Week 8	Lab 8: Microsoft office Power 2010 point continue ...
Week 9	Lab 9: Microsoft office Excel 2010
Week 10	Lab 10: Microsoft office Excel 2010 continue ...
Week 11	Lab 11: Network and Internet
Week 12	Lab 12: Search engine , E-mail and E-chatting
Week 13	Lab 13: Seminar
Week 14	Lab 14: Seminar continue ...
Week 15	Lab 15: Exam in lab.

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Suggested Books 1. Graham Brown, David Watson, *Cambridge IGCSE Information and Communication Technology"*, 3rd Edition (2020) 2. Alan Evans, Kendall Martin, Mary Anne Poatsy, "Technology In Action Complete",16th Edition (2020). 3. Ahmed Banafa, "Introduction to Artificial Intelligence (AI)*, Ist Edition (2024). 4. الخضر على الخضر بحاث , " أساسيات الحاسوب" 4. 2016	Yes

	5. الدكتور عادل عبدالنور , "مدخل إلى عالم الذكاء الاصطناعي 2005 .	
Recommended Texts	-	No
Websites	-	

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

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

MODULE DESCRIPTION FORM
نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	Engineering Drawing			**Module Delivery**	
Module Type	Basic			☒ **Theory** ☐ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	CERDRW				
ECTS Credits	5				
SWL (hr/sem)	125				
Module Level	1		**Semester of Delivery**	1	
Administering Department	Type Dept. Code		**College**	Type College Code	
Module Leader	Israa Najati Akram		**e-mail**	israanajatia@gmail.com	
Module Leader's Acad. Title	Assist lecture		**Module Leader's Qualification**	MS.C	
Module Tutor	Name (if available)		**e-mail**	E-mail	
Peer Reviewer Name	Name		**e-mail**	E-mail	
Scientific Committee Approval Date	01/12/2023		**Version Number**	2.0	

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. This course deals with the basic concept of engineering drawing 2. Understanding of concepts, tools and methods of engineering drawing 3. To understand concept of descriptive geometry

	4. To provide participants with basic theoretical and practical skills to produce engineering drawings with the aid of AutoCAD 5. Introduce students to AutoCAD software requirements 6. To introduce the students, the techniques constructing the various types of polygons, curves and scales
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	Important: Write at least 6 Learning Outcomes, better to be equal to the number of study weeks. 1. Apply the correct principle to produce engineering drawing 2. Construct engineering drawing precisely using CAD application 3. Complete engineering drawing correctly by manual and AutoCAD application 4. Ability to read and prepare engineering drawing 5. Ability to make freehand sketching 6. Power of imagine, analyze and communicate 7. Computer aided design or drafting provides powerful tools for drafting, design and manufacture, drawing regulation .
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. <u>Engineering drawing (45 hrs)</u> Fundamentals of eng. drawing, lettering, geometrical construction of shapes, Paper size, Lettering & title blocks, Orthographic projection , Isometric and oblique projection , Perspective drawing , Freehand sketching , Basic geometrical solids , Development of surfaces , Practical freehand sketching exercises DESCRIPTIVE GEOMETRY <u>(15 hrs)</u>: Basics and definitions, methods of graphical representation, theory of projection, projection of points and straight lines, operations of determination straight lines parameters. CAD (45hrs)
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	6
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	32	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	2.1
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**	6	6% (10)	Continuous	All
	Onsite Assignments	8	8% (100)	Continuous	All
	Online Assignment	8	8% (100)	Continuous	All
	Lab مختبر	10	10% (10)	10	All
	project	1	3%(10)	Continuous	All
	reports	1	3%(10)	Continuous	All
Summative assessment	**Midterm Exam**	2hr	10% (10)	7	LO #1 - #5
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
Week 1	Introduction of engineering drawing : types of lines, using of drawing instruments and equipments , drawing sheet layout, lettering, Paper size & title blocks and tables CAD: About AutoCAD ,creating folders, file handing command(save open,new,…) Descriptive geometry: Basic and definitions
Week 2	Basic geometrical constructions CAD: drawing units ,drawing limits, display tools Descriptive geometry: Method of graphic representation
Week 3	Drawing and dividing straight lines, angles

	CAD: Defining position Descriptive geometry: Theory of projection
Week 4	Drawing arc and circles Tangency construction of straight lines and arcs CAD: Drawing using absolute Cartesian coordinates ,relative rectangular coordinates ,relative polar coordinates Descriptive geometry: Types of projection
Week 5	Exercises about Tangency construction of straight lines and arcs CAD: Exercises about the methods Descriptive geometry: Projection of points
Week 6	Drawing polygons CAD: Extra Exercises about the methods Descriptive geometry: Classifications of straight lines in first quadrature, slope of lines Drawing contour lines of engineering parts CAD: Basic geometric shapes: point ,line, construction line, ray ,multiline Descriptive geometry: Projection of lines
Week 7	Midterm Exam
Week 8	Orthographic projection drawing: Introduction of projection types and views CAD: Draw circle Descriptive geometry: Operations of determination straight lines parameters: true length and angles of inclination,
Week 9	Exercising first angle projection of solid parts CAD: Draw arc Descriptive geometry: The auxiliary plane method and exercises
Week 10	Exercising first angle projection of solid parts CAD: Draw polygon Descriptive geometry: Rotative method
Week 11	dimensioning: Exercising types of dimensioning on projection views CAD: Draw ellipse Descriptive geometry: Geometric method
Week 12	sectional drawing: Types and techniques CAD: Modification tools :copy , move ,mirror rotate Descriptive geometry: Determination of line traces
Week 13	Development of sectional views. CAD: Modification tools :scale,trim ,extend ,fillet ,chamfer ,offset Descriptive geometry: quiz
Week 14	Orthogonal projection isometric drawing Drawing sheet layout calculations for isometric drawing CAD: Extra Exercises about modification tools Descriptive geometry: Mid exam
Week 15	Exercising of isometric drawing

	CAD: Extra Exercises about modification tools
Week 16	**Preparatory week before the final Exam**

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts		Yes
Recommended Texts		No
Websites		

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

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

MODULE DESCRIPTION FORM
نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	Physics			**Module Delivery**	
Module Type	Basic			☒ **Theory** ☐ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	PHYS110				
ECTS Credits	5				
SWL (hr/sem)	125				
Module Level	1		**Semester of Delivery**	1	
Administering Department	Type Dept. Code		**College**	Type College Code	
Module Leader	Dr. Rana Taha Mohamed		e-mail	Rana.t.mohamed@nahrainuniv.edu.iq	
Module Leader's Acad. Title	Ass.Professor		Module Leader's Qualification	Ph.D.	
Module Tutor	Tagreed K. Hamad		e-mail		
Peer Reviewer Name					
Scientific Committee Approval Date	01/12/2023		**Version Number**	5.0	

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

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	8. To understand basics for physics 9. To understand theoretical and practical on the various branches of physics and their development in all its types and applications. 10. To Give students the tool for Universal forces Units and physics Quantities 11. To Know the basics for analysis and serve specific problems 12. To learn the general law and application of physics

Module Learning Outcomes مخرجات التعلم للمادة الدراسية	9. Learning Introduction of Physical Quantities and Units 10. Adentfining Mechanichs and the laws of motions 11. Understanding the force , Newtens law and application 12. Understanding Rotational , rigid body and Periodic motion 13. Learning Thermodynamics and laws 14. Understanding Basic of vibration and Mechanical wave phenomena , 15. Understanding Electric and magnatic filds and equations for each tearms 16. The phenomena of Light , reflection and refraction laws 17. Spsfaining The modern physics
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. Physics Definitions , Quantities and Unitss [7hrs],Mechanics , Motion in One and twon Dimension , Vectors and Laws of Motion[6 hrs] , Energy ,work,Momentum ,torque and Collisions , Rotational Motion[6 hrs],Thermodynamics , Heat transver and The Laws of Thermodynamics [6hrs],Vibrations and types of Waves [6 hrs], Electricity and Magnetism ,Electric Forces and Electric Fields , Current and Resistance[6 hrs] ,. Magnetism filed and magnatic force, Properties of Electromagnetic Waves[6 hrs]. Light, Reflection and Refraction ,the Law of Refraction [6hrs], law ,total internal reflection [6 hrs]. Modren physics , relativity mechanic, Quantum mechanic , The Laser [6hrs].

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The main strategy that will be adopted in delivering this module is to develop students in engineering field, application of different types of physiscs .This will be achieved through classes, interactive tutorials ,asking questions ,discussions and seminar s in class and homework ..

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	63	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	62	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	4.1
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)	Cont.	All
	Online Assignments	2	5% (10)	Cont.	All
	Onsite Assignments	2	10% (10)	Cont.	All
	Report	5	10% (10)	Cont.	All
	Lab	1	5%(5)	Cont.	All
Summative assessment	**Midterm Exam**	2 hr	10% (10)	7	LO # 3 to 7
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	**Physics**: Definitions and Applications ,Vector ,Physical Quantities Units and conversion
Week 2	**Mechanics**: Motion in one Dimension , velocity acceleration, Free falling bodies ,Motion in two dimention ,Project motion ,Circular motion ,
Week 3	**Mechanics:** Force The Newtons̀ law of motion and Application **,** Energy ,work,power, Impulse, Momentum ,torque and Collisions, .
Week 4	**Mechanics:** Rotational Motion ,torque ,Rotational Equilibrium and the Law of Gravity , Equation of rigid body ,Periodic motion
Week 5	**Thermodynamics:** Heat transver ,heat capacity ,mechansum of heat transver , The Laws of Thermodynamics
Week 6	**Vibrations and Waves** Mechanical wave phenomena , Vibration bodes , Sound wave
Week 7	**Electricity and Magnetism**: Electric Forces and Electric Fields , Electrical Energy and Capacitance , Current and Resistance , Direct-Current Circuits, Magnetism filed and magnatic force , Induced Voltages and Inductance, Properties of Electromagnetic Waves
Week 8	**Light and Optics** The Nature and propagation of light , Speed and sorce of light ,The Refraction and Reflection, law ,Total internal reflection ,Dispersion and Prisms
Week 9	**Modren physics** Relativity mechanic, Quantum mechanic , The Laser
Week 10	**Selactive subject**
Week 11	**Selactive subject**

Week 12	**Selactive subject**
Week 13	**Selactive subject**
Week 14	**Selactive subject**
Week 15	**report**
Week 16	**Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	HOOKE'S LAW spring
Week 2	Acceleration of free fall by mean of the Simple pendulum
Week 3	Forces
Week 4	The surface tension of water by the pull of microscope slide
Week 5	Refractive index of (glass) by real and apparent depth using traveling microscope
Week 6	Moment of inertia and angular acceleration
Week 7	Heat capacity of metals
Week 8	Boyle's Law
Week 9	Laws of lenses and optical instruments
Week 10	Michelson interferometer

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	University Physics, Sear - Zemasky - Young Seventh Edition ,Volum 1 ,1987—2000—	yes
Recommended Texts	Physics , OpenStax Rice University,2020	NO
Websites		

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

	F – Fail	راسب	(0-44)	Considerable amount of work required

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

MODULE DESCRIPTION FORM
نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	Mathematics			**Module Delivery**	
Module Type	Basic			☒ **Theory** ☐ **Lecture** ☐ **Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	CERMAT1				
ECTS Credits	5				
SWL (hr/sem)	125				
Module Level		1	**Semester of Delivery**		1
Administering Department		Type Dept. Code	**College**		
Module Leader	Dr. Dina Yaqoob Alsaka		**e-mail**	Dina.y.alsaka@nahrainuniv.edu.iq	
Module Leader's Acad. Title		Lecturer	**Module Leader's Qualification**		Ph.D
Module Tutor	Dina Yaqoob Alsaka		**e-mail**	Dina.y.alsaka@nahrainuniv.edu.iq	
Peer Reviewer Name		Name	**e-mail**	E-mail	
Scientific Committee Approval Date		1/12/2023	**Version Number**		2.0

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. Introduce students to some basics of mathematics, which contribute to understanding some of the theories Based on solutions to some engineering problems 2. Solving some engineering problems using basic mathematics theories 3. The ability to find solutions to problems through mathematical methods and drawing.
Module Learning Outcomes	1. knowledge of Algebraic and trigonometric functions, their types, properties, and graph.

مخرجات التعلم للمادة الدراسية	2. knowledge of the limits and continuity of the functions. 3. Teaching students to evaluate the limits of algebraic and trigonometric functions and to benefit from their definition in solving some Engineering problems and also finding the solutions. 4. Teaching students to define derivatives, find their solutions, and benefit from them in some applications. 5. The ability to Drawing functions and extracting the optimization, as well as the meaning of the rate of change by using derivatives. 6. knowledge the concept of integrals and finding the results of definite and indefinite integrals. 7. The ability to calculate the area under a curve or between two functions, curve length, as well as finding volumes using integration applications
Indicative Contents المحتويات الإرشادية	• PRE-CULCULUS, EXPONENTIAL and logarithmic functions, properties and plots (4hrs) • Trigonometric and hyperbolic functions , properties and plots(4hrs) • Derivative, chain rule and limits (4hrs) • Engineering Applications (4hrs) • Integration (4hrs) • Integral applications (4hrs) • Methods of integration-1(4hrs) • Methods of integration-2(4hrs) • Complex number (4hrs) • Matrix (4hrs) • Matrix operations (Cramer rule, Gauss elimination, inverse) (4hrs) • Polar coordinates – 1(4hrs) • Polar coordinates – 2 (4hrs)

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	78	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	5

Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	47	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	3.1
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**	3	15% (10)	Continuous	All
	Online Assignments	3	12% (10)	Continuous	All
	Onsite Assignments	3	9% (10)	Continuous	All
	Report	1	4% (10)	8	
Summative assessment	**Midterm Exam**	2 hrs	10% (10)	7	LO #1 - #5
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	PRE-CULCULUS, EXPONENTIAL and logarithmic functions, properties and plots
Week 2	Trigonometric and hyperbolic functions , properties and plots
Week 3	Derivative, chain rule and limits
Week 4	Engineering Applications
Week 5	Integration
Week 6	Integral applications
Week 7	Exam 1
Week 8	Methods of integration-1
Week 9	Methods of integration-2
Week 10	Complex number
Week 11	Matrix
Week 12	Matrix operations (Cramer rule, Gauss elimination, inverse)
Week 13	Polar coordinates – 1
Week 14	Polar coordinates – 2
Week 15	Preparation for final exam

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	**George B. Thomas, JR. and Ross L. Finney** ***"Calculus*** **",11th Ed. 2010.**	yes
Recommended Texts	**THOMAS'CALCULUS** *Based on the original work by* George B. Thomas, Jr. Twelfth Edition	yes
Websites		

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

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

MODULE DESCRIPTION FORM
نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	DC Electrical circuits			**Module Delivery**	
Module Type	Core			☒ **Theory** ☐ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	LAER110				
ECTS Credits	7				
SWL (hr/sem)	175				
Module Level	1		**Semester of Delivery**	1	
Administering Department	Type Dept. Code		**College**	Type College Code	
Module Leader	Jalal Abdulla Khalaf		**e-mail**	Jalal.a.khalaf@nahrainuniv.edu.iq	
Module Leader's Acad. Title	lecturer		**Module Leader's Qualification**	MS.C	
Module Tutor	Name (if available)		**e-mail**	E-mail	
Peer Reviewer Name	Name		**e-mail**	E-mail	
Scientific Committee Approval Date	01/12/2023		**Version Number**	2.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisites 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 first objective is to give students fundamentals of Electrical circuits, while the second is to teach them several of the important fields of applications of Electrical circuits.**
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Demonstrate a fundamental understanding of electrical circuit theory, principles, and terminology. 2. Analyze and solve basic DC and AC circuit problems using various circuit analysis techniques. 3. Apply Ohm's law, Kirchhoff's laws, and other circuit theorems to analyze circuit behavior and calculate voltage, current, and power in circuits.

	4. Design and construct basic electrical circuits, including voltage dividers, current dividers and basic signal circuits. 5. Understand the characteristics and behavior of passive circuit components like resistors, capacitors, and inductors. 6. Analyze and interpret circuit diagrams and schematics. 7. Identify and troubleshoot common problems in electrical circuits. 8. Apply safety practices and guidelines when working with electrical circuits. 9. Utilize simulation software or tools to model and analyze electrical circuits. 10. Demonstrate effective communication skills in presenting circuit analysis results and findings.
Indicative Contents المحتويات الإرشادية	• Ohm's Law, Power, Efficiency, Energy (4hrs) • Series Circuits, Voltage Sources in Series, Kirchhoff's Voltage Law, (4hrs) • Voltage Divider Rule, Voltage Sources and Ground, Double-Subscript Notation(4hrs) • Parallel Elements, Total Conductance and Resistance, Parallel Circuits, Kirchhoff's Current Low. (4hrs) • Current Divider Rule, Voltage Sources In Parallel, Open And Short Circuits. (4hrs) • Series-Parallel Networks, General Approach, Reduce and Return Approach, Block Diagram Approach, Descriptive Examples, Ladder Networks (4hrs) • Methods Of Analysis And Selected Topics (Dc), Current Sources, Source Conversions, Current Sources In Parallel, Current Sources In Series, (8hrs) • Branch-Current Analysis, Mesh Analysis (General Approach), Supermesh Currents, Mesh Analysis (Format Approach) (8hrs) • Nodal Analysis (General Approach), Supernode, Nodal Analysis (Format Approach), (8hrs) • Bridge Networks, Y-D (T-P) And D-Y (P-T) Conversions (4hrs) • Network Theorems, Superposition Theorem, The′venin's Theorem, Norton's Theorem(8hrs)

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	6
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	82	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	5.5
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**175**		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	2	10% (10)	Cont.	All
	Online Assignments	2	10% (10)	Cont.	All
	Report	4	10% (10)	Cont.	All
	Lab	1	10%(10)	Cont.	All
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	Ohm's Law, Power, Efficiency, Energy
Week 2	Series Circuits, Voltage Sources in Series, Kirchhoff's Voltage Law,
Week 3	Voltage Divider Rule, Voltage Sources and Ground, Double-Subscript Notation
Week 4	Parallel Elements, Total Conductance and Resistance, Parallel Circuits, Kirchhoff's Current Low.
Week 5	Current Divider Rule, Voltage Sources In Parallel, Open And Short Circuits.
Week 6	Series-Parallel Networks, General Approach, Reduce and Return Approach, Block Diagram Approach, Descriptive Examples, Ladder Networks
Week 7	Miterm Exam 1
Week 8	Methods Of Analysis And Selected Topics (Dc), Current Sources, Source Conversions, Current Sources In Parallel, Current Sources In Series cont.
Week 9	Branch-Current Analysis, Mesh Analysis (General Approach), Supermesh Currents, Mesh Analysis (Format Approach)
Week 10	Branch-Current Analysis, Mesh Analysis (General Approach), Supermesh Currents, Mesh Analysis (Format Approach) cont.

Week 11	Nodal Analysis (General Approach), Supernode, Nodal Analysis (Format Approach),
Week 12	Nodal Analysis (General Approach), Supernode, Nodal Analysis (Format Approach) cont.
Week 13	Bridge Networks, Y-D (T-P) And D-Y (P-T) Conversions
Week 14	Midterm Exam 2
Week 15	Network Theorems, Superposition Theorem, The′venin's Theorem, Norton's Theorem cont.

Delivery Plan (Weekly Lab. Syllabus)
المنهاج الاسبوعي للمختبر

	Material Covered
Week 1	Lab 1: Use of electrical circuits Instruments and Ohm's Law.
Week 2	Lab 2: Series-Parallel circuits.
Week 3	Lab 3: Kirchhoff's Law.
Week 4	Lab 4: Star delta transformation.
Week 5	Lab 5: Superposition, Thevenin and Norton's theroems.
Week 6	Lab 6:

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	**Introductory Circuit Analysis, by Boylestad,10th Ed., 2005.**	
Recommended Texts	• **Theory and Problems in Electrical circuits, by MahmoodNahvi& Joseph A. Administer, 4th Ed., McGraw-Hill, 2003.** • **Principles and applications of electrical engineering, by Rizzoni, 3rdEd., McGraw-Hill, 2005.** • **Electric circuits ,byNilsson, 7thEd., Prentice-Hall, 1999.** • **Schaum's outline ofTheory and Problems of basic circuit analysis, by John O|. Malley, 2nd Ed., McGraw-Hill, 1992.** • **A textbook of Electrical technology , byB.L. Theraja and A.K. Theraja,S.Chand & Company Ltd., 2009**	
Websites		

Grading Scheme
مخطط الدرجات

Group	Grade	التقدير	Marks %	Definition
Success Group	**A -** Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors

(50 - 100)	**C -** Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX –** Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

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

MODULE DESCRIPTION FORM
نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	Laser Sciences			**Module Delivery**	
Module Type	Core			☒ **Theory** ☐ **Lecture** ☐ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	LAER111				
ECTS Credits	3				
SWL (hr/sem)	75				
Module Level	1		**Semester of Delivery**	1	
Administering Department	Type Dept. Code		**College**	Type College Code	
Module Leader	Prof. Dr. Shaymaa Riyadh Tahhan		**e-mail**	shaymaa.r.al-tahhan@nahrainuniv.edu.iq	
Module Leader's Acad. Title	Assistant Professor		**Module Leader's Qualification**	Ph.D.	
Module Tutor	Prof. Dr. Shaymaa Riyadh Tahhan		**e-mail**	shaymaa.r.al-tahhan@nahrainuniv.edu.iq	
Peer Reviewer Name	Prof. Dr. Bassam G. Rasheed		**e-mail**	bassam.g.rasheed@nahrainuniv.edu.iq	
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	1. **To understand the fundamental concepts of Laser principles.** 2. **To provide the knowledge of Laser beam properties**.

Module Learning Outcomes مخرجات التعلم للمادة الدراسية	8. Recognize the difference between the laser beam and the ordinary light. 9. List the various terms associated with laser science. 10. Summarize what is meant by stimulated emission. 11. Discuss the energy levels of atoms and molecules. 12. Derive the Einstein relations of the two energy levels. 13. Identify the basic laser system components and their function. 14. Explain the laser light beam properties. 15. Explain the laser light beam characteristics. 16. Summarize a well-known types of laser types.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. **Lecture #1-** <u>The Wave Nature of Light [2 hr]</u> What is light? The equation of the light wave. **Lecture #2-** <u>The Spectrum and Wavelength[2 hr]</u> Table of the main light wave spectrum and how to find the energy and frequency of from the wavelength and vise verse **Lecture #3-** <u>Energy Levels and States (Atoms and Molecules) [2 hr]</u> The main difference between Atoms and Molecules energy levels and introduction to the electronical energy levels. How to find the required energy to move a particles between a known levels. **Lecture #4-** <u>Blackbody Radiation [2 hr]</u> The behavior of the light beam as a function of temperature **Lecture #5-** <u>The Boltzmann Distribution [2 hr]</u> The ratio of a Boltzmann distribution and its normal distribution **Lecture #6-** <u>Absorption, Spontaneous and Stimulated Emission [2 hr]</u> The conditions of each transition of the above-mentioned emissions and the requirements for achieving each of them. **Lecture #7-** <u>Population Inversion [2 hr]</u> The main condition to achieve population inversion and its methodology **Lecture #8-** <u>Two Levels System (Einstein Coefficient) [2hr]</u> The derivative of rate equation for two level systems for all the three different transitions. **Lecture #9-** <u>Pumping Mechanisms [2hr]</u> Types of pumping

	Details of more popular pumping types optical and electrical How to solve the pumping rate equation **Lecture #10-** 3 and 4 Energy Level systems [2hr] Laser types according to energy levels Details of 3 and 4 energy levels The main differences between 3 and 4 energy levels **Lecture #11-** Laser Light Beam Characteristics (Spatial and Temporal) [2hr] Experiment of Young and Michelson to show how the laser light beam create difference fringes according to time and space difference **Lecture #12-** Laser Light Beam Properties (Coherency, Directionality, Monochromaticity, Brightness, Brilliance) [2hr] The definition of each property for the laser light beam and how difference than ordinary light beam **Lecture #13-** Types of Lasers according to Active Medium [2hr] Brief details of the well-known laser types with a schematic drawing of the system

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	1- Lectures included a very clear figures on each subject in mean. 2- Also, more clarification of schematics will be displayed on the white board. 3- Discussion and showing some attractive videos during class to clarify the behavior of the light beam so they can interactive. 4- Additionally, there are many exercises that the students could solve with others interactivity and more as home works.

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	42	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	2.8
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**75**		

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

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	**The Wave Nature of Light**
Week 2	**The Spectrum and Wavelength**
Week 3	**Energy Levels and States (Atoms and Molecules)**
Week 4	**Blackbody Radiation**
Week 5	**The Boltzmann Distribution**
Week 6	**Absorption, Spontaneous and Stimulated Emission**
Week 7	**Mid Exam**
Week 8	**Population Inversion**
Week 9	**Two Levels System (Einstein Coefficient)**
Week 10	**Pumping Mechanisms**

Week 11	**3 and 4 Energy Level systems**
Week 12	**Laser Light Beam Characteristics (Spatial and Temporal)**
Week 13	**Laser Light Beam Properties (Coherency, Directionality, Monochromaticity, Brightness, Brilliance)**
Week 14	**Types of Lasers according to Active Medium**
Week 15	**Preparatory week before the final Exam**

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	1- Orazio Svelto, “Principles of Lasers”, FIFTH EDITION, 2010. 2- William T. Silfvast, “Laser Fundamentals”, second edition, 2004.	Yes
Recommended Texts	Orazio Svelto, “Principles of Lasers”, FIFTH EDITION, 2010.	Yes
Websites	1- The "Laser Adventure " by Rami ARIELI, freely available online. 2- Dr. BC Choudhary, professor, NITTTR, Sector-26, Chandigarh- 160019. Power point lectures online.	

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

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

MODULE DESCRIPTION FORM
نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	English Language			**Module Delivery**	
Module Type	Basic			☒ **Theory** ☐ **Lecture** ☐ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	URENG1				
ECTS Credits	2				
SWL (hr/sem)	50				
Module Level	1		**Semester of Delivery**	2	
Administering Department	Type Dept. Code		**College**	Type College Code	
Module Leader	Sheelan S. Kamal		**e-mail**	sheelan.s.kamal@nahrainuniv.edu.iq	
Module Leader's Acad. Title	Asst Lect.		**Module Leader's Qualification**	Ph.D.	
Module Tutor	Sheelan S. Kamal		**e-mail**	sheelan.s.kamal@nahrainuniv.edu.iq	
Peer Reviewer Name	Name		**e-mail**	E-mail	
Scientific Committee Approval Date	01/06/2023		**Version Number**	1.0	

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

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	1. Training the students to acquire imperative communicative competence in specialists Engineering English. 2. Improve the language proficiency of the students in English with emphasis on listening, speaking, reading, and writing skills. 3. Enables the students to study and comprehend the prescribed lessons and subjects more effectively relating to their theoretical and practical components. 4. To develop the communication skills of the students in both formal and informal situations.

Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Acquiring text analysis skills, highlighting effectives, crucial information quickly and efficiently. 2. Building essay writing and Reporting skills. 3. Identifying words and phrases that helps them with paraphrasing texts and ideas. 4. Acquiring imperative communicative competence in Engineering specific English, shall enable students to work confidently and effectively. 5. The material is designed to focus on listening, speaking, reading, and writing in topics common to all fields of Engineering such as monitoring and control, procedures and precautions, and Engineering design, which shall help students gain practical knowledge and practice of specialized English for engineers. It is suitable to be used in an engineering environment both practically and professionally 6. The authentic activities based on everyday engineering situations from describing technical problems and Solutions to working with drawings make this material practical and motivating to students.
Indicative Contents المحتويات الإرشادية	These materials have been chosen for their importance to user interaction. They consolidate learning from the pre-requisites and lay the foundations for further study, particularly specialized English for all engineering fields. The English Language specification offers a common core of analytical methods, topics and skills that have proven value, set within a flexible program that allows colleges to shape learning and teaching in ways appropriate to their contexts, and constituencies. It has the additional benefit of being co-teachable with our associate professors even when they are not specialized in teaching English, thus widening options for faculty and students, ensuring that we are able to deliver a program of study that is coherent and manageable.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Assessment is based on hand-in assignments, written exam, Case study, Quizzes, seminars, Practical testing and Online testing.

Student Workload (SWL) الحمل الدراسي للطالب			
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	1.13

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	16% (8)	Throughout the course	LO #1-6
	Online Assignments	1	9% (9)	Throughout the course	LO # 1-6
	Onsite Assignments	2	10% (5)	Throughout the course	All
	Seminar	1	5% (5)	Throughout the course	All
Summative assessment	**Midterm Exam**	2 hr	10% (10)	9	All
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Introduction – reading texts • understanding texts and quotes • identifying key information & keywords • summary writing
Week 2	Unit 1 & 2 selections – Headway upper intermediate • Present tenses (simple, continuous, & perfect) • Future tenses (simple & continuous) • Passive voice for present & future tenses • Paraphrasing texts • Using suitable synonyms and antonyms
Week 3	Unit 3 selections – Headway upper intermediate • Past tenses (simple, continuous, & perfect) • Passive voice for past tenses • Paraphrasing texts • Using suitable synonyms and antonyms Assignment 1
Week 4	Essay writing

	• Types of essays and outlines • Collecting information for an essay • Thesis statements and topic sentences • Writing abstracts and conclusions
Week 5	- Unit 1 – Technology in use Skills: describing technical functions and applications explaining how technology works emphasizing technical advantages simplifying and illustrating technical explanations Language: verbs, adjectives, adverbs, and phrases to describe to describe advantages adding emphasis, simplifying, and rephrasing Reading: space elevators Listening: GPS applications
Week 6	Assignment 2
Week 7	**QUIZ
Week 8	Unit 2 Materials Technology Skills describing specific materials, categorizing materials, specify and describing properties, discussing quality issues Language: common materials, categories of materials, phrases for describing requirements Reading: materials recycling - regenerative brakes Listening: and environmental audit, High performance watches, specialized tools
Week 9	MID EXAM
Week 10	Unit 3 Components and assemblies Skills: describing component shapes and features, explaining and assessing manufacturing techniques, explaining jointing and fixing techniques, describing positions of assembled components Language: shapes and 3D features, words to describe machining, phrases for describing suitability. prepositions of position Reading: cutting operations - flow waterjet technology - joints and fixings - the flying garden chair Listening: a project briefing, electrical blogs and sockets, Metal fabrication, cluster ballooning
Week 11	Unit 4 Engineering design Skills: working with drawings, discussing dimensions and precision, describing design phases and procedures, resolving design problems Language: views on technical drawings, drawing types and versions, verbs for describing stages of a design process, verbs and nouns for describing design problems Reading: super flat floors - Queries and instructions Listening: a drawing query - scale - a floor design - design procedures - revising a detail
Week 12	unit 5 Breaking point Skills: describing types of technical problem, assessing and interpreting faults, describing the causes of faults, discussing repairs and Maintenance

	Language: verbs and adjectives for describing technical problems, words for describing faults and their severity, phrases for describing certainty and uncertainty, adjectives for describing technical problems, verbs for describing repairs and Maintenance Reading: air Transit flight 236 Listening: erasing car test session. test session problems, technical helpline. tire pressure problems, a maintenance check
Week 13	Unit 6 technical development Skills: discussing technical requirements, suggesting ideas and Solutions, assessing feasibility, describing improvements and redesigns Language: phrases for referring to issues, quality, and extent. Phrases for suggesting Solutions and alternatives. it idioms to describe feasibility and redesigning Reading: mammoth problem Listening: stimulator requirements and effects, lifting options, hole requirements and forming, a project briefing
Week 14	ASSIGNMENT 3
Week 15	**GENERAL QUIZ**
Week 16	**Preparatory week before the final Exam**

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

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	1. Cambridge English for Engineering 2. Headway - intermediate 3. The Academic Guide for English (A handout by Lect. Zena Ibrahim & Asst. Lect. Sheelan S. Kamal)	Yes
Recommended Texts	1. English for engineers and technologists 2. Cambridge Professional English in Use	No
Websites	1. https://www.ets.org/toefl.html 2. https://www.bbc.co.uk/learningenglish/	

Grading Scheme مخطط الدرجات

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

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

MODULE DESCRIPTION FORM
نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	اللغة العربية			**Module Delivery**	
Module Type	Basic			☒ **Theory** ☐ **Lecture** ☐ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	URARA				
ECTS Credits	2				
SWL (hr/sem)	50				
Module Level		1	**Semester of Delivery**		2
Administering Department		ECER	**college**	ENGINEERING	
Module Leader	اسماء كمال عبد الغني		**e-mail**	Asmaa.kamal@.nahrainuniv.edu.iq	
Module Leader's Acad. Title		مدرس	**Module Leader's Qualification**		ماجستير
Module Tutor			**e-mail**	E-mail	
Peer Reviewer Name		لجنة مركزية من الكلية	**e-mail**	E-mail	
Scientific Committee Approval Date		13/06/2023	**Version Number**		1.0

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

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	1-تجسيدا لوطنيتنا، واعتزازا بالقرآن الكريم وديننا الإسلامي، وأرثنا الغائر في القدم. 2-تدريب الطلبة على القراءة الصحيحة والرسم الإملائي السليم – لن لمسنا جميعا ميدانيا في الجامعات ضعف طلبتنا في القراءة والكتابة -وتنمية حواس السمع والبصر واللمس عن طريق أدراكهم مواطن الجمال والفائدة في النصوص المختلفة. 3-توسيع أفق الطلبة من خلال تنمية خيالهم وابتكاراتهم. 4-تعويد الطلبة على محاورة الأخرين بلغة سليمة مهذبة، واحترام الرأي الاخر. 5-تزويدهم بالأفكار والمعاني والقيم الأخلاقية مما يدخل في تكوينهم الفكري والثقافي.

	6-تدريب الطلبة على التفكير المنظم الذي تتضح فيه المقدمات والاسباب وما يترتب عليها من نتائج وخواتيم 7-تدريب الطلبة على النظام والنظافة وجمال التنسيق. 8-تنمية القدرة لدى الطلبة على الارتجال في المواقف وتعزيز الشخصية. 9-توسيع خبراتهم وثرواتهم اللغوية .
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1-ممارسة الكتابة والكلام باللغة العربية الفصيحة 2-كتابة البحوث والتقارير وإنجاز متطلبات العمل المختلفة بلغة سليمة خالية من الأخطاء. 3-تعزيز المحتوى العربي على الشبكة العنكبوتية. 4-المحافظة على القيم الروحية والاجتماعية. 5-تنمية ثقافة الانصات وأدب الحوار، وتعزيز قيم الأمانة والإخلاص في العمل. 6-الاتصال والتواصل مع الاخرين، والتكيف مع وظائف بديلة عن الوظيفة التي يقتضينها تخصصه. 7-الحفاظ على الهوية القومية والدينية.
Indicative Contents المحتويات الإرشادية	1-تعد اللغة وسيلة اتصال تحقق الوظيفة الرئيسة لها، وهي الفهم والاستيعاب، والادراك الفعلي للعلوم المختلفة لا يكون إلا باللغة الام، لأنها العنصر الحيوي لتفعيل الادراك لدى المتعلم، وان درس الطالب المادة العلمية بلغة أخرى. 2 -تساعد الطلبة على قوة الملاحظة والدقة والنظام والترتيب. 3-بيان العلاقة بين سلامة الكتابة، والمعنى الذي تعبر عنه هذه الكلمات، لان الكتابة تعتمد عمليات عقلية لها طابع تحليلي وتركيبي مرتبط بصحة الاتصال اللغوي بين الافراد والجماعات. 4-المادة اللغوية المقدمة للطلبة يجب أن تناسب المستوى اللغوي والعقلي لهم، بحيث تتدرج موضوعاتها من السهل الى الصعب، ومن المحتوى القصير الى الطويل، وان يتصل موضوعاتها بحياة الطلبة اليومية، علما أن هذا الجانب مهم جدا؛ لان طلبتنا يعانون ضعفا في القراءة والكتابة. 5-تنمية مهارات القراءة والكتابة عند الطلبة ضرورية جدا لارتباطها بمسيرتهم العلمية والعملية.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	يعتمد التقييم على مهام عملية، واختبارات كتابية سواء امتحانات أو تقارير، وتبادل الادوار داخل القاعة الدراسية، واعتماد الحوار والسرد القصصي أذ انه من الأنشطة الإثرائية التي تتم بوقت قصير وتمثل أداة مراجعة لمعرفة استيعاب الطالب، والتعلم بالأقران والتعاون بين الدارسين، وهذا يدعم التفاعل المعرفي داخل القاعة في جو من المرح والحركة لشد انتباه الطالب.

Student Workload (SWL) الحمل الدراسي للطالب			
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	1.13
otal 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	3	15% (5)	Continuous	All
	Online Assignments	2	4% (2)	Continuous	All
	Onsite Assignments	1	8% (8)	Continuous	All
	Report	1	8% (8)	Continuous	All
	Seminar	1	5% (5)	Continuous	All
Summative assessment	Midterm Exam	3 hr	10% (10)	7	All
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	مقدمة تعريفية عن اللغة العربية وأهمية الاعراب فيها، الجملة الاسمية
Week 2	الجملة الفعلية (الفعل الماضي، المضارع، الامر)
Week 3	الأسماء المنصوبة، جمع المذكر السالم، جمع المؤنث السالم
Week 4	الأسماء الخمسة، المثنى، الأسماء الموصولة
Week 5	العدد
Week 6	الإملاء، كتابة الضاد والظاء، كتابة التاء القصيرة والطويلة.
Week 7	كتابة الهمزة المتوسطة والمتطرفة، كتابة همزة الوصل والقطع.
Week 8	البناء الهندسي للنص القرآني (سورة مريم، سورة الكهف)
Week 9	فن الخطابة، خطبة للرسول محمد (ص)، خطبة للخليفة أبي بكر الصديق (رض)
Week 10	فن الرسائل، رسالة للرسول محمد (ص)، رسالة لأمير المؤمنين علي بن أبي طالب (ع)
eek 11	دراسة نص شعري من عصر ما قبل الإسلام / مقطع من معلقة عنترة
Week 12	دراسة نص شعري من العصر الإسلامي / مقطع من قصيدة كعب بن زهير
Week 13	دراسة قصيدة من العصر العباسي / مقطع من قصيدة لأبي الطيب المتنبي
Week 14	دراسة نص شعري من العصر الحديث / يدر شاكر السياب
Week 15	كيفية كتابة البحث وتوظيف علامات الترقيم بصورة صحيحة.
Week 16	أسبوع تحضيري قبل الامتحان

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	Available in the Library?
Required Texts	القرآن الكريم، جامع الدروس العربية، محاضرات في العصر الإسلامي	نعم

Recommended Texts	كتب قواعد اللغة العربية، كتاب شرح المعلقات، كتاب قصص من القرآن الكريم، ديوان عنترة، ديوان كعب بن زهير، ديوان المتنبي، ديوان بدر شاكر السياب	نعم
Websites	كل مواقع تدريس اللغة العربية غنية بالمعرفة وممكن اعتمادها	

Grading Scheme
مخطط الدرجات

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

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

MODULE DESCRIPTION FORM
نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	Fundamentals of Engineering Mathematics			**Module Delivery**	
Module Type	Basic			☒ **Theory** ☐ **Lecture** ☐ **Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	CERMAT2				
ECTS Credits	5				
SWL (hr/sem)	125				
Module Level		1	**Semester of Delivery**		2
Administering Department		Type Dept. Code	**College**		
Module Leader	Dina Yaqoob Alsaka		**e-mail**	Dina.y.alsaka@nahrainuniv.edu.iq	
Module Leader's Acad. Title		Lecturer	**Module Leader's Qualification**		Ph.D.
Module Tutor	Dina Yaqoob Alsaka		**e-mail**	E-mail	
Peer Reviewer Name		Name	**e-mail**	E-mail	
Scientific Committee Approval Date		12/06/2023	**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. Introduce students to some basics of mathematics, which contribute to understanding some of the theories Based on solutions to some

	engineering problems 2. Solving some engineering problems using basic mathematics theories 3. The ability to find solutions to problems through mathematical methods and drawing.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	8. knowledge of Algebraic and trigonometric functions, their types, properties, and graph. 9. knowledge of the limits and continuity of the functions. 10. Teaching students to evaluate the limits of algebraic and trigonometric functions and to benefit from their definition in solving some Engineering problems and also finding the solutions. 11. Teaching students to define derivatives, find their solutions, and benefit from them in some applications. 12. The ability to Drawing functions and extracting the optimization, as well as the meaning of the rate of change by using derivatives. 13. knowledge the concept of integrals and finding the results of definite and indefinite integrals. 14. The ability to calculate the area under a curve or between two functions, curve length, as well as finding volumes using integration applications
Indicative Contents المحتويات الإرشادية	• Vector algebra, Vector descriptions of line, Lengths angles and projections, Vector dot and cross products (4hrs) • Vector descriptions of planes, Intersection of planes and lines, Planes: Shortest distances, (4hrs) • Vector valued functions, Revision, Vector geometry(4hrs) • Directional derivatives and gradient(4hrs) • Engineering applications(4hrs) • D-operator method and separation of variables (4hrs) • Double integration(4hrs) • Change of order (4hrs) • Double integration in polar coordinates (4hrs) • Engineering applications (4hrs) • Engineering applications(4hrs) • Cartesian Triple integration (4hrs) • Applications (4hrs)

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	78	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	5
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	47	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	3.1
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	11.4% (10)	Continuous	All
	Online Assignments	2	11.4% (10)	Continuous	All
	Onsite Assignments	2	11.4% (10)	Continuous	All
	Project	1	5.8% (10)	Continuous	All
Summative assessment	**Midterm Exam**	2	10% (10)	7	All
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Vector algebra, Vector descriptions of line, Lengths angles and projections, Vector dot and cross products
Week 2	Vector descriptions of planes, Intersection of planes and lines, Planes: Shortest distances,
Week 3	Vector valued functions, Revision, Vector geometry
Week 4	Directional derivatives and gradient
Week 5	Engineering applications
Week 6	D-operator method and separation of variables
Week 7	Mid exam
Week 8	Double integration

Week 9	Change of order
Week 10	Double integration in polar coordinates
Week 11	Engineering applications
Week 12	Engineering applications
Week 13	Cartesian Triple integration
Week 14	Applications
Week 15	Preparation for final exam

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	**George B. Thomas, JR. and Ross L. Finney** ***"Calculus*** **",11th Ed. 2010.**	yes
Recommended Texts	**THOMAS'CALCULUS** *Based on the original work by* George B. Thomas, Jr. Twelfth Edition	yes
Websites		

Grading Scheme
مخطط الدرجات

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

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

MODULE DESCRIPTION FORM
نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	AC Electrical circuits			**Module Delivery**	
Module Type	Core			☒ **Theory** ☐ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	LAER120				
ECTS Credits	7				
SWL (hr/sem)	175				
Module Level	1		**Semester of Delivery**	2	
Administering Department	Type Dept. Code		**College**	Type College Code	
Module Leader	Jalal Abdulla Khalaf		**e-mail**	Jalal.a.khalaf@nahrainuniv.edu.iq	
Module Leader's Acad. Title	Lecturer		**Module Leader's Qualification**	MS.C	
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	**The first objective is to give students fundamentals of Electrical circuits, while the second is to teach them several of the important fields of applications of Electrical circuits.**
Module Learning Outcomes	1. Demonstrate a fundamental understanding of electrical circuit theory, principles, and terminology.

مخرجات التعلم للمادة الدراسية	2. Analyze and solve basic DC and AC circuit problems using various circuit analysis techniques. 3. Apply Ohm's law, Kirchhoff's laws, and other circuit theorems to analyze circuit behavior and calculate voltage, current, and power in circuits. 4. Design and construct basic electrical circuits, including voltage dividers, current dividers and basic signal circuits. 5. Understand the characteristics and behavior of passive circuit components like resistors, capacitors, and inductors. 6. Analyze and interpret circuit diagrams and schematics.7. Identify and troubleshoot common problems in electrical circuits. 8. Apply safety practices and guidelines when working with electrical circuits. 9. Utilize simulation software or tools to model and analyze electrical circuits. 10. Demonstrate effective communication skills in presenting circuit analysis results and findings.
Indicative Contents المحتويات الإرشادية	• Sinusoidal Alternating Waveforms, Sinusoidal Ac Voltage Characteristics and Definitions, The Sine Wave, General Format for The Sinusoidal Voltage or Current, Phase Relations, Average Value, Effective (Rms) Values. (8hrs) • Sinusoidal Alternating Waveforms, Sinusoidal Ac Voltage Characteristics and Definitions, The Sine Wave, General Format for The Sinusoidal Voltage or Current, Phase Relations, Average Value, Effective (Rms) Values cont. • Response Of Basic R, L, and C Elements To A Sinusoidal Voltage Or Current, Average Power And Power Factor, Complex Numbers, Rectangular Form, Polar Form, (8hrs) • Series and Parallel Ac Circuits , Series Ac Circuits , Impedance and The Phasor Diagram , Series Configuration(8hrs) • Parallel Ac Networks. (4hrs) • Series-Parallel Ac Networks, Illustrative Examples(4hrs) • Methods of Analysis and Selected Topics (Ac), Source Conversions, Mesh Analysis. (8hrs) • Nodal Analysis, Bridge Networks (Ac), delta –star Conversions, (8hrs) • Power in AC , Apparent Power, Inductive Circuit and Reactive Power . (4hrs) • Power Triangle, The Total P, Q, and S, Power-Factor (8hrs)

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	108	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	7
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	67	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	4.5
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**175**		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	2	8.9% (10)	Continuous	All
	Online Assignments	2	8.9% (10)	Continuous	All
	Projects / Lab.	1	4.3% (10)	Continuous	All
	Report	4	17.8% (10)	Continuous	All
Summative assessment	**Midterm Exam**	2	10% (10)	7	All
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Sinusoidal Alternating Waveforms, Sinusoidal Ac Voltage Characteristics and Definitions, The Sine Wave, General Format for The Sinusoidal Voltage or Current, Phase Relations, Average Value, Effective (Rms) Values.
Week 2	Sinusoidal Alternating Waveforms, Sinusoidal Ac Voltage Characteristics and Definitions, The Sine Wave, General Format for The Sinusoidal Voltage or Current, Phase Relations, Average Value, Effective (Rms) Values cont.

Week 3	Response Of Basic R, L, and C Elements To A Sinusoidal Voltage Or Current, Average Power And Power Factor, Complex Numbers, Rectangular Form, Polar Form,
Week 4	Response Of Basic R, L, and C Elements To A Sinusoidal Voltage Or Current, Average Power And Power Factor, Complex Numbers, Rectangular Form, Polar Form, cont.
Week 5	Series and Parallel Ac Circuits , Series Ac Circuits , Impedance and The Phasor Diagram , Series Configuration
Week 6	Midterm Exam 1
Week 7	Parallel Ac Networks.
Week 8	Series-Parallel Ac Networks, Illustrative Examples
Week 9	Methods of Analysis and Selected Topics (Ac), Source Conversions, Mesh Analysis.
Week 10	Methods of Analysis and Selected Topics (Ac), Source Conversions, Mesh Analysis,cont.
Week 11	Nodal Analysis, Bridge Networks (Ac), delta –star Conversions,
Week 12	Nodal Analysis, Bridge Networks (Ac), delta –star Conversions cont.
Week 13	Power in AC , Apparent Power, Inductive Circuit and Reactive Power .
Week 14	Midterm Exam 2
Week 15	Power Triangle, The Total P, Q, and S, Power-Factor

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: Use of cathode ray oscilloscope (CRO) and function generator.
Week 2	Lab 2: RLC circuit and AC circuits.
Week 3	Lab 3: Series-Parallel RLC AC circuits.
Week 4	Lab 4: Resonance in Series a.c circuits.
Week 5	Lab 5:
Week 6	Lab 6:

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	**Introductory Circuit Analysis, by Boylestad,10th Ed., 2005.**	
Recommended Texts	• **Theory and Problems in Electrical circuits, by MahmoodNahvi& Joseph A. Administer, 4th Ed., McGraw-Hill, 2003**. • **Principles and applications of electrical engineering, by Rizzoni, 3rdEd., McGraw-Hill, 2005.** • **Electric circuits ,byNilsson, 7thEd., Prentice-Hall, 1999.** • **Schaum's outline ofTheory and Problems of basic circuit analysis, by John O|. Malley, 2nd Ed., McGraw-Hill, 1992.** • **A textbook of Electrical technology , byB.L. Theraja and A.K. Theraja,S.Chand & Company Ltd., 2009**	
Websites		

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

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

MODULE DESCRIPTION FORM
نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	Geometrical Optics			**Module Delivery**	
Module Type	Core			☒ **Theory** ☐ **Lecture** ☐ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	LAER121				
ECTS Credits	6				
SWL (hr/sem)	150				
Module Level	1		**Semester of Delivery**	2	
Administering Department	LAER		**College**	CREQ	
Module Leader	Dr. Dina Yaqoob Matti		**e-mail**	dina.y.alsaka@nahrainuniv.edu.iq	
Module Leader's Acad. Title	lecturer		**Module Leader's Qualification**	Ph.D	
Module Tutor	Dr. Dina Yaqoob Matti		**e-mail**	dina.y.alsaka@nahrainuniv.edu.iq	
Peer Reviewer Name	Name		**e-mail**	E-mail	
Scientific Committee Approval Date	01/06/2023		**Version Number**	1.0	

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

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	**To introduce an obvious idea about different optical laws and properties as well as most of elements and devices that concern lasers as one of the optics science branches in order to insure how to apply these instruments for laser systems.**
Module Learning Outcomes	1. Understand the fundamental principles of optics, including geometrical optics, wave optics, and quantum optics. 2. Apply basic concepts of optics to real-world situations, including the analysis

مخرجات التعلم للمادة الدراسية	of optical systems and devices. 3. Learn about the properties of optical materials, including their refractive index and optical absorption. 4. Understand the principles of light propagation and polarization. 5. Analyze the behavior of light in various optical systems, including lenses, mirrors, and prisms. 6. Learn about the principles of interference and diffraction and their applications in optics.
Indicative Contents المحتويات الإرشادية	**The Propagation of Light:** Introduction, Rayleigh Scattering, Reflection, Refraction, Fermat's Principle, Total Internal Reflection, Optical Properties of Metals Familiar Aspect s of the Interaction of Light with Matter, Photons, Waves and Probability (4hrs) **Geometrical Optics:** Lenses**,** Stops**,** Mirrors**,** Prisms**,** Fiber optics Optical systems, Wave front Shaping, Gravitational Lenses, Thick, lenses and Lens system, Analytical Ray Tracing, Aberrations, GRIN system (8hrs). **Polarization:** The Nature of Polarized Light**,** Polarizers**,** Dichroism Birefringent , Scattering and Polarization, Polarization by Reflection, Retarders, Circular Polarizer, Polarization of polychromatic light, Liquid Crystals, A mathmatical Description of Polarization (6hrs) **Interference:** General Considerations**,** Conditions of Interference Wavefront-Splitting Interferometers, Amplitude-Splitting, Interferometers, Types and Localization of Interference Fringes, Multiple-Beam Interference, Applications of Interferometry (4hrs) **Diffraction:** Fraunhufer Diffraction**,** Fresnel Diffraction**,** Kirchhoff's Scalar Diffraction Theory**,** Boundary Diffraction Waves Rectangular Aperture, Circular Aperture, Resolving Power, Telescope, Dispersion (4hrs)

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	63	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	87	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	5.8

Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**150**

Module Evaluation
تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	4	16% (10)	Continuous	All
	Online Assignments	4	16% (10)	Continuous	All
	Seminars	1	4% (10)	Continuous	All
	Report	1	4% (10)	Continuous	All
Summative assessment	**Midterm Exam**	2hr	10% (10)	7	All
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
Week 1	The Propagation of Light
Week 2	The Propagation of Light cont.
Week 3	Geometrical Optics
Week 4	Geometrical Optics cont.
Week 5	Geometrical Optics cont.
Week 6	Geometrical Optics cont.
Week 7	Exam 1
Week 8	Polarization
Week 9	Polarization cont.
Week 10	Polarization cont.
Week 11	Interference
Week 12	Interference cont.
Week 13	Diffraction
Week 14	Diffraction cont.
Week 15	Preparation for final exam

Delivery Plan (Weekly Lab. Syllabus)
المنهاج الاسبوعي للمختبر

	Material Covered
Week 1	
Week 2	

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	1- Optics, 4th ed., Eugene Hecht 2002 2- Introduction to Modern Optics, 2nd ed., Grant Fowles 3- Fundamentals of Optics, 4th ed., Francis A. Jenkins	
Recommended Texts		
Websites		

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

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

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Engineering Mechanics**			**Module Delivery**	
Module Type	Core			☒ **Theory** ☐ **Lecture** ☒ **Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	LAER122				
ECTS Credits	6				
SWL (hr/sem)	150				
Module Level	1		**Semester of Delivery**	2	
Administering Department	Type Dept. Code		**College**	Type College Code	
Module Leader	Ahmed Riedh Abass Al-Hamaoy		**e-mail**	Ahmed.al-hamaoy@nahrainuniv.edu.iq	
Module Leader's Acad. Title	Assist. Prof. Lecturer		**Module Leader's Qualification**	Ph.D	
Module Tutor	Ahmed Riedh Abass Al-Hamaoy Noor Yahya Abbas		**e-mail**	Ahmed.al-hamaoy@nahrainuniv.edu.iq	
Peer Reviewer Name	Name		**e-mail**	E-mail	
Scientific Committee Approval Date	01/06/2023		**Version Number**	1.0	

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

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	This course aims to complement the first year student information with basic engineering subjects in Thermodynamics and Heat Transfer, which may expand his understanding of engineering aspects and develop his analytical capabilities. Also, it aims to complement him with static mechanics which may expand his understanding of engineering aspects and develop his analytical capabilities.
Module Learning Outcomes	1. Understanding the basic concepts of thermodynamics such as work, heat, energy, and entropy. 2. Analyzing thermodynamic systems and processes.

مخرجات التعلم للمادة الدراسية	3. Understanding the laws of thermodynamics and their applications. 4. Evaluating the efficiency of thermodynamic cycles. 5. Understanding the modes of heat transfer (conduction, convection, and radiation). 6. Analyzing the rate of heat transfer in various applications 7. Understanding and calculating heat transfer coefficients. 8. Applying principles of heat transfer in various engineering applications such as heat exchangers, power plants, and refrigeration systems 9. Understanding the concept of static equilibrium. 10. Modelling forces and moments acting on a body at rest. 11. Solving problems related to stability and equilibrium of structures.
Indicative Contents المحتويات الإرشادية	**Thermodynamics (20 hrs): Some concepts and definition:** The thermodynamics system and the control volume**,** Properties and state of a substance. Processes and cycles. Units for mass, length, pressure, and temperature. **Properties of a pure substance:** Vapor -liquid-solid phase equilibrium in a pure substance. Independent properties of a pure substance. Equation of state. Tables of thermodynamics properties. **Work and heat:** Definition of work, units for work. Work done at the moving boundary of a simple compressible system. Definition of heat, unit of heat. **The first law of thermodynamics.** For a system undergoing a cycle, and for a change in state of a system. Internal energy, enthalpy and specific heat. **Heat Transfer (20 hrs):** Conduction heat transfer, thermal conductivity, One dimensional steady state conduction in plane and composite walls, Conduction in radial systems, one and multiple cylindrical sections. Convection heat transfer and heat transfer coefficient, Convention boundary conditions and the overall heat transfer coefficient. **Engineering Mechanics (36hrs): Static**: Operations with forces Resultants and equilibrium of coplanar and spatial force systems. Trusses and cables. Friction. First moments and centroids. Area moments of inertia. Mass moment of inertia.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The course adopts a variety of learning and teaching strategies to enhance students' understanding and problem-solving skills. Some of the strategies include: - Lectures that introduce the main concepts and theories, supported by examples and demonstrations. - Tutorials that reinforce the lecture materials and allow students to practice solving problems in groups or individually.

	- Laboratory sessions that enable students to conduct experiments and observe the phenomena related to thermodynamics, heat transfer and static engineering. - Assignments that require students to apply their knowledge and skills to real-world scenarios and design problems. - Quizzes and exams that assess students' mastery of the course objectives and outcomes. The course also encourages students to use online resources and textbooks for self-study and revision. The instructor provides feedback and guidance throughout the course to help students achieve their learning goals.

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	6
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	57	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	3.8
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**150**		

Module Evaluation
تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	3	9% (18)	Continuous	All
	Online Assignments	4	6% (9)	Continuous	All
	Onsite Assignments	4	6% (9)	Continuous	All
	Lab.	5	15% (18)	Continuous	All
	Project	1	4% (24)	Continuous	All
Summative assessment	**Midterm Exam**	2hr	10% (10)	7	All
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered

Week 1	**Some concepts and definition of Thermodynamics**
Week 2	**Properties of a pure substance.**
Week 3	**Work and heat.**
Week 4	**Work and heat (Cont.)**
Week 5	**The first law of thermodynamics**
Week 6	**Conduction heat transfer**
Week 7	**Midterm Exam #1, Conduction heat transfer (Cont.)**
Week 8	**Convection heat transfer**
Week 9	**Convection heat transfer (Cont.)**
Week 10	**Static: Operations with forces Resultants**
Week 11	**equilibrium of coplanar and spatial force systems**
Week 12	**Midterm Exam #2, Trusses and cables**
Week 13	**Friction**
Week 14	**First moments and centroids**
Week 15	**Area and Mass moments of inertia.**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Calibration of a Pressure Gauge
Week 2	Boyle's Law
Week 3	Thermodynamic Properties and Saturated state
Week 4	Application of 1st Law of Thermodynamics
Week 5	Conduction Along a Simple Bar
Week 6	Pipe Insulation Efficiency
Week 7	Steam Condenser

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	1. FUNDAMENTALS OF THERMODYNAMICS 2. HEAT TRANSFER by J.P. Holman 3. ENGINEERING MECHANICS, VOLUME 1, STATICS, by J.L. Meriam and L.G. Kraige, John Wiley and Sons	Yes
Recommended Texts		
Websites	Thermodynamics of Biomolecular Systems | Biological Engineering | MIT OpenCourseWare Introduction to Heat Transfer | Mechanical Engineering | MIT OpenCourseWare	

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

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	Workshop			**Module Delivery**	
Module Type	Support			☐ **Theory** ☐ **Lecture** ☐ **Lab** ☐ **Tutorial** ☒ **Practical** ☐ **Seminar**	
Module Code	CERWOR				
ECTS Credits	2				
SWL (hr/sem)	50				
Module Level	1		**Semester of Delivery**	2	
Administering Department	Mechanical Engineering		**College**	College of Engineering	
Module Leader	Abdulhakeem Amer Salman		**e-mail**	abdulhakeem.a.salman@nahrainuniv.edu.iq	
Module Leader's Acad. Title	Lecturer assistant		**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. Provide students with the fundamental technical knowledge and skills in workshop to 2. recognize, analyze and solve problems, and to apply these abilities to the generation 3. of new knowledge, ideas or products in industry.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Explain the use of measuring and bench fitting tools. 2. Show the use of safety equipment during workshop practice. 3. Knowledge and understanding the use of different tools. 4. Describe the basic concepts of different types of welding. 5. Display the ability to use different basic machining operations keeping all

	safety precautions in mind.
Indicative Contents المحتويات الإرشادية	

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

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	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	1.13
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**50**		

Module Evaluation
تقييم المادة الدراسية

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

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
Week 1	Principles of safety in workshop and laboratories
Week 2	Machining process
Week 3	Machining process

Week 4	Sheet metal forming
Week 5	Sheet metal forming
Week 6	Welding process
Week 7	Welding process
Week 8	Mid 1 Examine
Week 9	Electricity
Week 10	Electricity
Week 11	Machining process
Week 12	Machining process
Week 13	Carpentry
Week 14	Carpentry
Week 15	Mid 2 Examine
Week 16	Preparatory week before the final Exam

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1,2	
Week 3,4	
Week 5,6,8,9	
Week 10	
Week 11,12	
Week 13,14	

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts		
Recommended Texts		
Websites		

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

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

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

MODULE DESCRIPTION FORM
نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**اللغة العربية 2**			**Module Delivery**	
Module Type	(علوم االنسان والمجتمع)			☒ **Theory** ☐ **Lecture** ☐ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	UARA2				
ECTS Credits	2				
SWL (hr/sem)	50				
Module Level	1		**Semester of Delivery**	2	
Administering Department	ECER		**College**	ENGINEERING	
Module Leader	اسماء كمال عبدالغني		**e-mail**	asmaa.kamal@nahrainuniv.edu.iq	
Module Leader's Acad. Title	مدرس مساعد		**Module Leader's Qualification**		
Module Tutor	Name (if available)		**e-mail**	E-mail	
Peer Reviewer Name	لجنة مركزية من الكلية		**e-mail**	E-mail	
Scientific Committee Approval Date	18/1/2025		**Version Number**	1.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	لا شيء	**Semester**	2
Co-requisites module	لا شيء	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	1-تجسيدا لوطنيتنا، واعتزازا بالقرآن الكريم وديننا االسالمي، وأرثنا الغائر في القدم. 2-تدريب الطلبة على القراءة الصحيحة والرسم االمالئي السليم – ألننا لمسنا ميدانيا في الجامعات العراقية وعلى المستويات كافة ضعف طلبتنا في القراءة والكتابة -وتنمية حواس السمع والبصر واللمس عن طريق أدراكهم مواطن الجمال والفائدة في النصوص المختلفة. 3-توسيع أفق الطلبة من خالل تنمية خيالهم وابتكاراتهم اللغوية عن طريق النصوص االدبية التي تدرس. 4-تعويد الطلبة على محاورة االخرين بلغة سليمة مهذبة، واحترام الرأي االخر. 5-تزويدهم باألفكار والمعاني والقيم االخالقية مما يدخل في تكوينهم الفكري والثقافي. 6-تدريب الطلبة على التفكير المنظم الذي تتضح فيه المقدمات واالسباب وما يترتب عليها من نتائج وخواتيم.

	7-تدريب الطلبة على النظام والنظافة وجمال التنسيق. 8-تنمية القدرة لدى الطلبة على االرتجال في المواقف وتعزيز الشخصية. 9-توسيع خبراتهم وثرواتهم اللغوية.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1 -إن يكون المتعلم قادرا على الكتابة والكالم باللغة العربية الفصيحة. 2-كتابة البحوث والتقارير وإنجاز متطلبات العمل المختلفة بلغة سليمة خالية من أألخطاء. 3-تعزيز المحتوى العربي على الشبكة العنكبوتية. 4-المحافظة على القيم الروحية واالجتماعية. 5-تنمية ثقافة االنصات وأدب الحوار، وتعزيز قيم أألمانة واإلخالص في العمل. 6-االتصال والتواصل مع االخرين، والتكيف مع وظائف بديلة عن الوظيفة التي يقتضينها تخصصه. 7-الحفاظ على الهوية القومية والدينية.
Indicative Contents المحتويات الإرشادية	1-تعد اللغة وسيلة اتصال تحقق الوظيفة الرئيسة لها، وهي الفهم واالستيعاب، واالدراك الفعلي للعلوم المختلفة ال يكون إال باللغة االم، ألنها العنصر الحيوي لتفعيل االدراك لدى المتعلم، وان درس الطالب المادة العلمية بلغة أخرى. 2 - تساعد الطلبة على قوة المالحظة والدقة والنظام والترتيب. 3-بيان العالقة بين سالمة الكتابة، والمعنى الذي تعبر عنه هذه الكلمات، الن الكتابة تعتمد عمليات عقلية لها طابع تحليلي وتركيبي مرتبط بصحة االتصال اللغوي بين االفراد والجماعات. 4-المادة اللغوية المقدمة للطلبة يجب أن تناسب المستوى اللغوي والعقلي لهم، بحيث تتدرج موضوعاتها من السهل الى الصعب، ومن المحتوى القصير الى الطويل، وان يتصل موضوعاتها بحياة الطلبة اليومية، علما أن هذا الجانب مهم جدا؛ الن طلبتنا يعانون ضعفا في القراءة والكتابة. 5-تنمية مهارات القراءة والكتابة عند الطلبة ضرورية جدا الرتباطها بمسيرتهم العلمية والعملية.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	يعتمد التقييم على مهام عملية، واختبارات كتابية سواء امتحانات أو تقارير، وتبادل االدوار داخل القاعة الدراسية، واعتماد الحوار والسرد القصصي أذ انه من أألنشطة إلثرائية التي تتم بوقت قصير وتمثل أداة مراجعة لمعرفة استيعاب الطالب، والتعلم باألقران والتعاون بين الدارسين، وهذا يدعم التفاعل المعرفي داخل القاعة في جو من المرح والحركة لشد انتباه الطالب.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	32	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	34	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	3.1
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	75		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	3	15% (5)	Continuous	All
	Online Assignments	2	4% (2)	Continuous	All
	Onsite assignment	1	8%(8)	Continuous	All
	seminars	1	5% (5)	Continuous	All
	Reports	1	8% (8)	Continuous	All
Summative assessment	**Midterm Exam**	3hr	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	سورة الكهف
Week 2	قصيدة للمتنبي / واحر قلباه
Week 3	قصيدة للشاعر بدر شاكر السياب / أنشودة المطر
Week 4	قصيدة للشاعر محمود درويش / وعاد في كفن
Week 5	العدد
Week 6	همزة الوصل وهمزة القطع
Week 7	االسماء الموصولة
Week 8	اسماء االشارة
Week 9	حروف الجر
Week 10	التوابع / التوكيد، النعت ، العطف ، البدل
Week 11	تكملة التوابع
Week 12	اختبار شهري
Week 13	التعريف باإلضافة
Week 14	االخطاء الشائعة
Week 15	اختبار شهري
Week 16	مراجعة

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	القرآن الكريم ، جامع الدروس العربية	نعم

Recommended Texts	كتب قواعد اللغة العربية، كتاب قصص من القرآن الكريم، ديوان المتنبي, ديوان بدر شاكر السياب ، ديوان محمود درويش	نعم
Websites	كل مواقع تدريس اللغة العربية غنية بالمعرفة وممكن اعتمادها	

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

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

MODULE DESCRIPTION FORM
نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	New Headway Plus Pre-Intermediate			**Module Delivery**	
Module Type	B			☒ **Theory** ☐ **Lecture** ☐ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	URENG2				
ECTS Credits	2				
SWL (hr/sem)	50				
Module Level		2nd year	**Semester of Delivery**		3
Administering Department		Type Dept. Code	**College**	Type College Code	
Module Leader	Sheelan S. Kamal		**e-mail**	sheelan.s.kamal@nahrainuniv.edu.iq	
Module Leader's Acad. Title		Asst. lecturer	**Module Leader's Qualification**		MA
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 Aims أهداف المادة الدراسية	1. A continuation of the material established at the previous level (I & II), which help students have a comprehensive knowledge of material. 2. Training the students to acquire imperative communicative competence in specialists Engineering English. 3. Improve the language proficiency of the students in English with emphasis on listening, speaking, reading, and writing skills. 4. Enables the students to study and comprehend the prescribed lessons and subjects more effectively relating to their theoretical and practical components.

	5. To develop the communication skills of the students in both formal and informal situations.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Students continue to build the theoretical and practical knowledge that shall enrich their careers, especially if either continued their higher studies or pursued careers with international entities or both. 2. Acquiring imperative communicative competence in Engineering specific English, shall enable students to work confidently and effectively. 3. The material is designed to focus on listening, speaking, reading, and writing in topics common to all fields of Engineering such as monitoring and control, procedures and precautions, and Engineering design, which shall help students gain practical knowledge and practice of specialized English for engineers. It is suitable to be used in an engineering environment both practically and professionally 4. The authentic activities based on everyday engineering situations from describing technical problems and Solutions to working with drawings make this material practical and motivating to students.
Indicative Contents المحتويات الإرشادية	These materials have been chosen for their importance to user interaction. They consolidate learning from the pre-requisites and lay the foundations for further study, particularly specialized English for all engineering fields. The English Language specification offers a common core of analytical methods, topics and skills that have proven value, set within a flexible program that allows colleges to shape learning and teaching in ways appropriate to their contexts, and constituencies. It has the additional benefit of being co-teachable with our associate professors even when they are not specialized in teaching English, thus widening options for faculty and students, ensuring that we are able to deliver a program of study that is coherent and manageable.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Assessment is based on hand-in assignments, written exams, class activities, quizzes, and practical testing

Student Workload (SWL) الحمل الدراسي للطالب			
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	1.13

Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	50

Module Evaluation
تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	2	10% (5)	Cont.	All
	Online Assignments	2	10% (5)	Cont.	All
	Onsite Assinment	2	10% (5)	Cont.	All
	Projects / Lab.	0	0	Cont.	All
	siminar	1	10% (10)	Cont.	All
Summative assessment	**Midterm Exam**	3 hr	10% (10)	7	All
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
Week 1	Introduction Unit 6 technical development Skills: discussing technical requirements, suggesting ideas and Solutions, assessing feasibility, describing improvements and redesigns Language: phrases for referring to issues, quality, and extent. Phrases for suggesting Solutions and alternatives. it idioms to describe feasibility and redesigning
Week 2	Unit 6 technical development (continuation) Skills: discussing technical requirements, suggesting ideas and Solutions, assessing feasibility, describing improvements and redesigns Reading: mammoth problem Listening: stimulator requirements and effects, lifting options, hole requirements and forming, a project briefing
Week 3	unit 7 procedures and precautions Skills: describing health and safety precautions, emphasizing the importance of precautions, discussing regulations and standards, working with written instructions and notices

	Language: types of industrial hazards, types of protection equipment, phrases for emphasizing importance, terms to describe regulations, common language on safety notices, languages style and written instructions Assignment 1
Week 4	unit 7 procedures and precautions (continuation) Skills: describing health and safety precautions, emphasizing the importance of precautions, discussing regulations and standards, working with written instructions and notices Reading: live line maintenance - helicopters safety on oil platforms Listening: a safety meeting - Hazard analysis - live line precautions - Safety training - oral instructions **short quiz
Week 5	Unit 8 monitoring and control Skills: describing automated systems, referring to measurable parameters, discussing readings and trends, giving approximate figures language words to describe automated systems, measurable parameters, fluctuations, approximating numbers
Week 6	Assignment 2
Week 7	** quiz
Week 8	Unit 8 monitoring and control (continuation) Skills: describing automated systems, referring to measurable parameters, discussing readings and trends, giving approximate figures Reading: Industrial process monitoring - dynamic demand controls Listening: intelligent buildings and automation, monitoring and control systems, electricity demand and supply problems, pumped storage hydroelectric power internal reviews
Week 9	**Mid Exam**
Week 10	unit 9 theory and practice Skills: explaining tests and experiments, exchanging views on predictions and theories, comparing results with expectations, discussing causes and effects Language: words to describe test types, words and phrases for stating assumptions, words and phrases for agreeing and disagreeing, phrases for comparing expectations and results, words for linking causes and effects
Week 11	unit 9 theory and practice (continuation) Skills: explaining tests and experiments, exchanging views on predictions and theories, comparing results with expectations, discussing causes and effects Reading: a rocket competition - chicken cannon Listening: vehicle design and testing - water rockets - air drop problems - moon landings
Week 12	unit 10 pushing the boundaries Skills: discussing performance and suitability, describing physical forces, discussing relative performance, describing capabilities and limitations

	Language: adjectives for describing suitability and Performance, words to describe Types of forces, words and phrases to describe degrees of difference, words to describe capabilities and limits
Week 13	unit 10 pushing the boundaries (continuation) Skills: discussing performance and suitability, describing physical forces, discussing relative performance, describing capabilities and limitations Reading: wind turbines fact file - solar Towers - transport alternatives - the sonic wind tests - the rocket sled proposal Listening: when turbines Towers - tolls structures
Week 14	Assignment 3
Week 15	**General quiz**
Week 16	**Preparatory week before the final Exam**

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

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	1. Cambridge English for Engineering 2. Headway for upper intermediate 3. The Academic Guide for English (A handout by Lect. Zena Ibrahim & Asst. Lect. Sheelan S. Kamal)	Yes
Recommended Texts	1. English for engineers and technologists 2. Cambridge Professional English in Use	No
Websites	1. https://www.ets.org/toefl.html 2. https://www.bbc.co.uk/learningenglish/	

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks (%)**	**Definition**
Success Group (50 - 100)	**A** - Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings

	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX –** Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

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

MODULE DESCRIPTION FORM
نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	Engineering Mathematics			**Module Delivery**	
Module Type	Basic			☒ **Theory** ☒ **Lecture** **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	CERMAT3				
ECTS Credits	5				
SWL (hr/sem)	125				
Module Level	2		**Semester of Delivery**	3	
Administering Department	Type Dept. Code		**College**	Type College Code	
Module Leader	Dr. Alhuda A. Oied		**e-mail**		
Module Leader's Acad. Title	Assist. Professor		**Module Leader's Qualification**	Ph.D.	
Module Tutor	Dr. Alhuda A. Oied		**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. The lecture aims to improve students' mathematical literacy and communication skills. They should be able to read and interpret mathematical notation, formulas, and graphs 2. The math lecture aims to develop students' critical thinking and problem-solving skills through mathematical exercises and

	applications. Students should be able to analyze engineering problems 3. Familiarize with vectors and matrices: Vectors and matrices play a crucial role in civil engineering, particularly in structural analysis and linear systems.. 4. Students should be able to apply calculus techniques to solve engineering problems, such as finding rates of change, determining areas and volumes, and analyzing the behavior of variables.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. CLO-1: Understanding numerical methods and computational tools such as matrix method and series. 2. CLO-2: Students should be able to analyze and model civil engineering systems such as engineering applications. 3. CLO-3: Students should be able to present mathematical derivations, analyses, and results in a clear and concise manner to engineering audiences. 4. CLO-4: Students should understand the limitations and assumptions associated with mathematical models used in civil engineering. By applying initial conditions and boundary conditions 5. CLO-5: Students should be able to understand and apply mathematical principles, such as calculus linear algebra, and probability theory, to solve engineering problems related to civil engineering.
Indicative Contents المحتويات الإرشادية	Jacobian transformation Approximation of Errors Multiple Integrals, Double Integrals, Working Rule, Change of the Order of Integration, Change of Variables in a Double Integral, Application to Area and moment and centroid. Polar coordinates, Double Integration for Polar Curves Spherical coordinates Triple Integrals, Applications to Volume and engineering Mid exam 1 Vector Integration, Line Integral, Surface Integral, Volume Integral Green's Theorem, Stock's Theorem, Gauss's Divergence Theorem Laplace transformation of elementary functions and inverse Laplace transform Sequences, Convergence and Divergence, Calculating Limits of Sequences, infinite series, Geometric Series, the nth-Term Test for a Divergent Series, Adding or Deleting Terms, The Integral Test Alternating Series, Absolute and Conditional Convergence, Power Series and Convergence Taylor and Maclaurin Series and their convergence and divergence tests, applications Mid exam 2

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	78	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	5
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	47	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	3.1
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)	Cont.	LO #1, #2 and #10, #11
	Online Assignments	2	10% (10)	Cont.	LO #3, #4 and #6, #7
	Onsite Assignments	2	10% (10)	Cont.	All
	Report	1	5% (5)	Cont.	All
	Seminars	1	5% (5)	Cont.	All
Summative assessment	**Midterm Exam**	2hr	20% (20)	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	Jacobian transformation
Week 2	Approximation of Errors

Week 3	Multiple Integrals, Double Integrals, Working Rule, Change of the Order of Integration, Change of Variables in a Double Integral, Application to Area and moment and centroid.
Week 4	Polar coordinates, Double Integration for Polar Curves
Week 5	Spherical coordinates
Week 6	Triple Integrals, Applications to Volume and engineering
Week 7	Mid exam 1
Week 8	Vector Integration, Line Integral, Surface Integral, Volume Integral
Week 9	Green's Theorem, Stock's Theorem, Gauss's Divergence Theorem
Week 10	Laplace transformation of elementary functions and inverse Laplace transform
Week 11	Sequences, Convergence and Divergence, Calculating Limits of Sequences,
Week 12	infinite series, Geometric Series, the nth-Term Test for a Divergent Series, Adding or Deleting Terms, The Integral Test
Week 13	Alternating Series, Absolute and Conditional Convergence, Power Series and Convergence
Week 14	Taylor and Maclaurin Series and their convergence and divergence tests, applications
Week 15	Mid exam 2

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

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**

Required Texts	Thomas' Calculus, 12th Edition" by George B. Thomas Jr., Maurice D. Weir,	Yes
Recommended Texts	Engineering Mathematics" by K.A. Stroud and Dexter J. Booth:	No
Websites		

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

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

MODULE DESCRIPTION FORM
نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	Fundamentals of Electronic Devices			**Module Delivery**	
Module Type	Core			☒ **Theory** ☐ **Lecture** ☒ **Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	LAER210				
ECTS Credits	7				
SWL (hr/sem)	175				
Module Level	2		**Semester of Delivery**	3	
Administering Department	Type Dept. Code		**College**	Type College Code	
Module Leader	Jalal Abdulla Khalaf		**e-mail**	Jalal.a.khalaf@nahrainuniv.edu.iq	
Module Leader's Acad. Title	Lecturer		**Module Leader's Qualification**	MS.C	
Module Tutor	Jalal Abdulla Khalaf		**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	LAER120	**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 first objective is to give students fundamentals basic electronics elements, and to teach them who to design electronics circuits.**

Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Understand fundamental electronic concepts and theories, including Ohm's Law, Kirchhoff's Laws, and circuit analysis. 2. Identify commonly used electronic components such as resistors, capacitors, diodes, transistors, and operational amplifiers, and understand their functions and applications. 3. Analyze and design basic electronic circuits using appropriate circuit simulation software. 4. Construct, test, troubleshoot, and repair electronic circuits using standard electronic testing equipment. 5. Understand the concept of signal amplification and the applications of operational amplifiers in signal processing circuits. 6. Understand the principles of power electronics, including rectifiers, filters, and voltage regulators. 7. Apply knowledge of electronics to solve practical problems related to current and emerging electronic technologies.
Indicative Contents المحتويات الإرشادية	• Semiconductor Diode, Semiconductor Materials, No Applied Bias, Reverse-Bias Condition, Forward-Bias Condition, Semiconductor Diode Characteristics, Breakdown Region. (4hrs) • Ge, Si, And Gaas, Temperature Effects, Ideal Versus Practical, Resitance Levels, Dc Or Static Resistance, Ac Or Dynamic Resistance, Average Ac Resistance. (4hrs) • Diode Equivalent Circuits, Piecewise-Linear Equivalent Circuit, Simplified Equivalent Circuit, Ideal Equivalent Circuit. (8hrs) • Sinusoidal Input ; Half Wave Rectification, Full Wave Rectifications(4hrs) • Clippers, Series,Parallel, Clampers(4hrs) • Zener Diodes, Voltage Multiplier Circuits(4hrs) • Bipolar Junction Transistors, Transistor Construction And Operation, Commun-Base Configuration, Commun- Emiter Configuration, Commun – Collector Configuration (8hrs) • Dc Biasing – Bjts,Fixed – Bias Configuration, Emitter- Bias Configuration (8hrs) • Voltage – Divider Bias Configuration, Collector Feedback Configuration (8hrs) • Emitter – Follower Cofiguration, Commun- Base Configuration, Miscellaneous Bias Configuration (8hrs)

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	108	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	7
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	67	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	4.5
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**175**		

Module Evaluation
تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	2	10% (10)	5 and 10	LO #1, #2 and #10, #11
	Online Assignments	2	5% (10)	2 and 12	LO #3, #4 and #6, #7
	Onsite Assignments	2	5% (10)	2 and 12	LO #3, #4 and #6, #7
	Projects / Lab.	3	10% (10)	Continuous	All
	Report	2	10% (10)	13	LO #5, #8 and #10
Summative assessment	**Midterm Exam**	2hr	10% (10)	7,14	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	Semiconductor Diode, Semiconductor Materials, No Applied Bias, Reverse-Bias Condition, Forward-Bias Condition, Semiconductor Diode Characteristics, Breakdown Region.
Week 2	Ge, Si, And Gaas, Temperature Effects, Ideal Versus Practical, Resitance Levels, Dc Or Static Resistance, Ac Or Dynamic Resistance, Average Ac Resistance.
Week 3	Diode Equivalent Circuits, Piecewise-Linear Equivalent Circuit, Simplified Equivalent Circuit, Ideal Equivalent Circuit.
Week 4	Sinusoidal Input ; Half Wave Rectification, Full Wave Rectifications

Week 5	Clippers, Series,Parallel, Clampers
Week 6	Zener Diodes, Voltage Multiplier Circuits
Week 7	Midterm Exam 1
Week 8	Bipolar Junction Transistors, Transistor Construction And Operation, Commun- Base Configuration, Commun- Emiter Configuration, Commun – Collector Configuration
Week 9	Bipolar Junction Transistors, Transistor Construction And Operation, Commun- Base Configuration, Commun- Emiter Configuration, Commun – Collector Configuration cont.
Week 10	Dc Biasing – Bjts,Fixed – Bias Configuration, Emitter- Bias Configuration
Week 11	Dc Biasing – Bjts,Fixed – Bias Configuration, Emitter- Bias Configuration cont.
Week 12	Voltage – Divider Bias Configuration, Collector Feedback Configuration
Week 13	Voltage – Divider Bias Configuration, Collector Feedback Configuration cont.
Week 14	Midterm exam 2
Week 15	Emitter – Follower Cofiguration, Commun- Base Configuration, Miscellaneous Bias Configuration cont.

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: Characteristics of diode
Week 2	Lab 2: Half-wave and Full-wave rectification
Week 3	Lab 3: Clipper and clamper circuits
Week 4	Lab 4: Voltage multiplier
Week 5	Lab 5: Ac to Dc conversion
Week 6	Lab 6:

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	**Electronic Devices and Circuit Theory, by Robert Boylestad and Louis Nashelsky, 1988published by Prentic-Hall International(UK) Limited**	
Recommended Texts	**- Electrical Engineering Principles and Applications, by ALLAN R . HAMBLELY, Third Edition, Pearson Education International, 2005 McGraw-Hill, 1985.** **- Electrical Technology, by B. L Theraja, S Chand & Company LTD, 2009**	
Websites		

Grading Scheme مخطط الدرجات

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

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

MODULE DESCRIPTION FORM
نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Electromagnetic Fields**			**Module Delivery**	
Module Type	Core			☒ **Theory** ☐ **Lecture** ☐ **Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	LAER211				
ECTS Credits	6				
SWL (hr/sem)	150				
Module Level	2		**Semester of Delivery**	3	
Administering Department	Type Dept. Code		**College**	Type College Code	
Module Leader	Dr. Ahmad K. Ahmad		**e-mail**	ahmad.ahmad@nahrainuniv.edu.iq	
Module Leader's Acad. Title	Professor		**Module Leader's Qualification**	Ph.D.	
Module Tutor	Name (if available)		**e-mail**	E-mail	
Peer Reviewer Name	Name		**e-mail**	E-mail	
Scientific Committee Approval Date	01/06/2023		**Version Number**	1.0	

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

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	The essential learning objectives for this course are for students to understand Maxwell's equation, i.e., understand the physical ideas included in them, the logical steps of the proofs that lead to these equations, and the ability to solve problems involving them. And the existence of electromagnetic waves as a consequence of Maxwell's equations. Students should also be familiar with the static properties of electric and magnetic fields. They should understand Faraday's law of electromagnetic induction and how it relates to the curl of the

	electric field. Students should be able to connect the law of conservation of charge with the idea of the displacement current. Students should understand how the Maxwell equations arise as a synthesis of the various individual electromagnetic phenomena.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	
Indicative Contents المحتويات الإرشادية	**Magnetic Forces, Materials, and Inductance** Force on a Moving Charge, Force on a Differential Current Element, Force between Differential Current Elements, Force and Torque on a Closed Circuit, The Nature of Magnetic Materials, Magnetization, and Permeability, Magnetic Boundary Conditions, The Magnetic Circuit, Potential Energy and Forces on Magnetic Materials, Inductance and Mutual Inductance (54 hrs) **Time-Varying Fields and Maxwell's Equations**: Faraday's Law, Displacement Current, Maxwell's Equations in Point Form, Maxwell's Equations in Integral Form, The Retarded Potentials (36 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 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	6
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	57	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	3.8
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**150**		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	4	16% (10)	Cont.	All
	Online Assignments	3	9% (10)	Cont.	All

	Onsite Assignments	2	6% (10)	Cont.	All
	seminars	1	5% (10)	Cont.	All
	Report	1	4% (10)	Cont.	All
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	Force on a Moving Charge
Week 2	Force on a Differential Current Element
Week 3	Force between Differential Current Elements
Week 4	Force and Torque on a Closed Circuit
Week 5	The Nature of Magnetic Materials, Magnetization, and Permeability
Week 6	Magnetic Boundary Conditions, The Magnetic Circuit
Week 7	Midterm Exam 1
Week 8	Potential Energy and Forces on Magnetic Materials
Week 9	Faraday's Law
Week 10	Displacement Current
Week 11	Time-Varying Fields and Maxwell's Equations
Week 12	Time-Varying Fields and Maxwell's Equations
Week 13	The Uniform Plane Wave
Week 14	The Uniform Plane Wave
Week 15	Midterm Exam 2

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	**Engineering Electromagnetics 8th ed.** **William H. Hayt, Jr. and John A. Buck**	yes
Recommended Texts		
Websites		

Grading Scheme

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

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

MODULE DESCRIPTION FORM
نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Optical Materials**			**Module Delivery**	
Module Type	Core			☒ **Theory** ☐ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	LAER212				
ECTS Credits	6				
SWL (hr/sem)	150				
Module Level	2		**Semester of Delivery**	3	
Administering Department	Type Dept. Code		**College**	Type College Code	
Module Leader	Ahmed Riedh Abass Al-Hamaoy		**e-mail**	Ahmed.al-hamaoy@nahrainuniv.edu.iq	
Module Leader's Acad. Title	Assist Prof.		**Module Leader's Qualification**	Ph.D.	
Module Tutor	Rana M. Taha		**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. Understanding the fundamental principles of materials science and engineering.** **2. Learning the properties, behavior, and applications of different materials, such as metals, ceramics, polymers, and composites.** **3. Understanding the structure of materials, including atomic and molecular bonding, crystal structures, and defects.** **4. Learning various techniques and methods used in materials characterization and analysis, such as X-ray diffraction, microscopy, and spectroscopy.**

	5. Learning about the relationships between processing, structure, properties, and performance of materials **.6. Developing skills in materials selection, design, and development.** **7. Understanding the environmental and societal impact of different materials and their use.** **8. Gaining technical communication skills to effectively communicate ideas and results related to materials science and engineering.**
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Understanding the relationship between the structure and properties of materials, including metals, ceramics, polymers and composites. 2. Understanding the processing techniques used to manufacture materials and how these techniques affect material properties. 3. Understanding the different types of forces acting on materials and how these forces affect their mechanical properties such as strength, toughness and ductility. 4. Knowledge of the different types of defects that can occur in materials and how they affect material properties. 5. Understanding the concept of phase diagrams and how they can be used to predict the microstructure and properties of materials. 6. Knowledge of the different materials testing techniques used to measure material properties such as tensile strength, hardness, and fatigue resistance. 7. Understanding how materials can be designed or modified to enhance their properties for specific applications. 8. Knowledge of the environmental impact of materials and how sustainability can be achieved through material selection and recycling.
Indicative Contents المحتويات الإرشادية	Chapter 1 The Atom (4hrs) - Self-Assessment Questions - Introduction - The Thomson Model of the Atom - The Rutherford Model of the Atom - The Wave Nature of Light - The Dual Nature of Matter - Probability and the Wave Function Chapter 2 Bonding (8hrs) - Introduction - The Hydrogen Molecule - The lonic Bond - The Covalent Bond - The Metallic Bond - The Secondary Bond - Mixed Bonding - Bond Strength Chapter 3 Internal Structure of Materials (8hrs) - Introduction - The Unit Cell - Types of Solid - Close-Packing - Miller Indices, Crystal Directions and Planes

	- Interplanar Separation - Bragg's Law and X-Ray Diffraction Chapter 4 Thermal Properties (8hrs) - Introduction - The Kinetic Theory of Gases - Thermal Energy and Degrees of Freedom - The Maxwell-Boltzmann distribution of Speed - Mean Free Path and Mean Free. Time - The Behaviour of a Real Gas - Thermal Behaviour in the Liquid State - Thermal Behaviour in the Solid State - Thermal Expansion - Thermal Conductivity - Specific Heat Chapter 5 Mechanical Properties (8hrs) - Introduction - The Stress/Strain Relationship - Elastic Behaviour - Plastic Behaviour and the Block Slip Theory - Plastic Behaviour and the structural- Defect Theory - Hardening - Strength of material - Mechanical Testing - Ductility - Cold Working, Recrystallization and Annealing - Oreep and Fatigue Chapter 6 Electronic States in Solids (8hrs) - Introduction - Energy Bands - Conductors, Semiconductors and - Insulators - The Fermi Level Chapter 7 Electrical Conduction (8hrs) - Introduction - The Behaviour of Electrons in a - Field-Free Metallic Crystal - The Crystal Under the Application of an Electric Field - Resistance and Temperature - Superconductivity Chapter 8 Laser crystals (8hrs)

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	93	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	6
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	57	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	3.8
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**150**		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	2	10% (10)	Cont.	All
	Online Assignments	2	5% (10)	Cont.	All
	Onsite Assignment	2	10% (10)	Cont.	All
	Projects / Lab.	4	10% (10)	Cont.	All
	Report	2	5% (10)	Cont.	All
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	The Atom
Week 2	Bonding
Week 3	Bonding Cont.
Week 4	Internal Structure of Materials
Week 5	Internal Structure of Materials Cont.
Week 6	Thermal Properties
Week 7	Thermal Properties Cont.
Week 8	Mechanical Properties
Week 9	Mechanical Properties Cont.

Week 10	Electronic States in Solids
Week 11	Electronic States in Solids Cont.
Week 12	Electrical Conduction
Week 13	Electrical Conduction Cont.
Week 14	Laser crystals
Week 15	Laser crystals Cont.

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

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	• **Engineering Materials (Part 1), by Mazin A. H. Kadhim & Kirit Patel, University of Technology, Baghdad, 1978.** • **Engineering Materials (Part 2), by Mazin A. H. Kadhim & Kirit Patel, University of Technology, Baghdad, 1978.**	
Recommended Texts		
Websites		

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks %**	**Definition**
Success Group (50 - 100)	**A -** Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors

	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX –** Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

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

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	Computer 2			**Module Delivery**	
Module Type	Basic			☒ **Theory** ☐ **Lecture** ☒ **Lab** ☐ **Tutorial** ☒ **Practical** ☒ **Seminar**	
Module Code	URCOM2				
ECTS Credits	3				
SWL (hr/sem)	75				
Module Level	2		**Semester of Delivery**	4	
Administering Department	LASER		**College**	Engineering	
Module Leader	Luma Zuhair mohammed		**e-mail**	lumazuhair@nahrainuniv.edu.iq	
Module Leader's Acad. Title	Asst. Professor		**Module Leader's Qualification**	Ph.D.	
Module Tutor	Luma Zuhair mohammed		**e-mail**	lumazuhair@nahrainuniv.edu.iq	
Peer Reviewer Name			**e-mail**		
Scientific Committee Approval Date			**Version Number**		

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

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	Module Objectives 1. **Security, Networking, and E-Commerce**

	a. Understand network types, components, and security fundamentals b. Identify network threats and vulnerabilities c. Comprehend electronic banking concepts and services including online banking, ATM, debit cards, phone and SMS banking 2. **Computer Troubleshooting** a. Identify and resolve common hardware and software problems encountered by computer users 3. **Fundamentals of Artificial Intelligence** a. Define AI, its history, techniques, approaches, and key characteristics b. Evaluate benefits, challenges, and ethical considerations of AI c. Analyze AI implementation in modern smartphones including virtual assistants, adaptive learning, and real-time translation 4. **AI Applications Across Industries** a. Survey AI applications in education, healthcare, transportation, marketing, finance, and robotics b. Understand automation technologies and their implementation 5. **AI's Societal Impact and Future** a. Evaluate AI's effect on social structures, international relations, and humanity's future b. Examine ethical challenges including privacy, surveillance, and employment impacts c. Explore emerging trends, recent research, and developing technologies in AI.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	After participating in the course, students would be able to: 1. **Understand Network Security Concepts** – Identify different types of networks, their components, and fundamental network security measures to mitigate threats. 2. **Analyze E-Commerce and Online Banking Services** – Evaluate various electronic banking services, including ATM usage, phone banking, and SMS banking, and their impact on financial transactions. 3. **Troubleshoot Common Computer Issues** – Diagnose and resolve common hardware and software problems encountered by computer users. 4. **Explore Artificial Intelligence Applications** – Examine the role of AI in modern technology, including virtual assistants, adaptive learning, real-time translation, and its applications in industries such as healthcare and finance. .
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. • **Security and Networking** – Understanding networks, types of networks, network components, and basic security measures.

	• E-**Commerce and Online Banking** – Concepts of electronic banking services such as ATM, debit cards, phone banking, and SMS banking. • Computer **Troubleshooting** – Identifying and solving common hardware and software problems. • Introduction **to Artificial Intelligence (AI)** – History, key techniques, characteristics, and challenges of AI. • AI **in Modern Smartphones** – AI-driven mobile technologies, virtual assistants, and real-time translation services. • AI **Applications and Tools** – AI in various industries such as education, healthcare, transportation, marketing, finance, and robotics. • AI **and Society** – Social implications of AI, ethical concerns, and the future of AI.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	• **Interactive Lectures and Discussions** – Use real-world examples, case studies, and open discussions to enhance student understanding and encourage participation. • **Hands-on Practical Sessions** – Implement lab exercises, troubleshooting tasks, and AI-based simulations to reinforce theoretical concepts through practical experience. • **Group Projects and Collaborative Learning** – Assign teamwork activities such as analyzing cybersecurity threats, developing AI applications, or troubleshooting computer issues to promote problem-solving and teamwork skills. • **Assessments and Feedback Mechanisms** – Use quizzes, assignments, and peer reviews to track student progress and provide constructive feedback for continuous improvement.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	63	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	12	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	0.8
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**75**		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	2	10% (10)	Continuous	All
	homework	2	7% (10)	12 and 15	LO #8, #10 and #11, #13
	Projects / Lab.	1	10% (10)	Continuous	LO #1 - #10
	classwork	3	7% (10)	Continuous	LO #1 - #10
	seminar	1	6% (10)	Continuous	LO #12
Summative assessment	**Midterm Exam**	2hr	10% (10)	8	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	Security and Networking: What is a network? Types of networks. Basic network components.
Week 2	Security and Networking (Cont.): Network Security Basics. Understanding network threats.
Week 3	E-Commerce: Concepts of Electronic banking services this include online banking: ATM and debit card services,Phone banking, SMS banking,
Week 4	Computer Troubleshooting: Identifying and solving common hardware and software problems that computer users encounter
Week 5	Introduction to Al: Definition of Al, History of Al, Al Techniques and Approaches
Week 6	Introduction to Al(Cont.): Key Characteristics of Al, Benefits of Al, Challenges and Ethical considerations.
Week 7	The Role of Al in Modern Smartphones:Al-Driven Mobile Technologies, Virtual Assistants (Siri, Google Assistant, Alexa)..
Week 8	Mid-term Exam
Week 9	The Role of Al in Modern Smartphones (Cont.):Adaptive Learning, Real Time Translation Services.

Week 10	Applications and Tools of Al: Overview of Al Applications in Various Industries, Education and Healthcare.
Week 11	Applications and Tools of Al (Cont.):Transportation, Marketing and Advertising.
Week 12	Al and Society: How Al affects social, Al and international relations, Al and the future of humanity.
Week 13	Ethical Challenges in Al: Al ethics, privacy and surveillance, the impact of Al on the job market.
Week 14	The Future of Al: Future trends in Al, recent research and emerging technologies
Week 15	Examples
Week 16	**Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1-3	Security and Networking: What is a network? Types of networks. Basic network components.
Week 4-6	Computer Troubleshooting: Identifying and solving common hardware and software problems that computer users encounter
Week 7-9	The Role of Al in Modern Smartphones
Week 10-11	Applications and Tools of Al
Week 12-13	Al and Society: How Al affects social, Al and international relations, Al and the future of humanity.
Week 14-15	Final exam

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	1. Graham Brown, David Watson, "Cambridge IGCSE Information and Communication Technology", 3rd Edition (2020) 2. Alan Evans, Kendall Martin, Mary Anne Poatsy, "Technology In Action Complete",16th Edition (2020). 3. Ahmed Banafa, "Introduction to Artificial Intelligence (AI)", 1st Edition (2024). 4. Microsoft Office 2019 Step by Step 1st Edition by Curtis Frye & Joan Lambert 5. الخضر علي الخضر بحاث. اساسيات الحاسوب,2016	NO

	6. الدكتور عادل عبد النور, مدخل الى عالم الذكاء الاصطناعي 2005,	
Recommended Texts		
Websites		

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

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

MODULE DESCRIPTION FORM
نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Principles of Management**			**Module Delivery**	
Module Type	Basic			☒ **Theory** ☐ **Lecture** ☐ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	CERMNG				
ECTS Credits	2				
SWL (hr/sem)	50				
Module Level	2		**Semester of Delivery**	4	
Administering Department	Type Dept. Code		**College**	Type College Code	
Module Leader	Inas Abdualameer Abbood		**e-mail**	inas.a.abbood@nahrainuniv.edu.iq	
Module Leader's Acad. Title	Assist lecture		**Module Leader's Qualification**	MS.C	
Module Tutor	Rasha Hashim Mahdi		**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 understand the meaning of management and what it is and its types, including strategic management, human resource management and leadership. 2. Understanding the interrelationship between these functions, and highlighting the basic principles and related concepts. 3. Knowledge of management principles that can be practiced in all functions and learn how to practice concepts and theories in organizations

	4. Understanding the levels of management, its role, the concept of leadership and its theories 5. Understand the main management functions planning, organizing, directing and manager roles 6. Acquisition of skill and experience in administrative work and knowledge of management levels 7. Understanding electronic management, the role of networks, the development in management and its role in the survival of any organization 8. Be able to know the administrative handling and its importance to the work of engineers and the work of a successful management model 9. The development of the student's ability to dialogue and discussion 10. The development of the student's ability to commit to performing homework within groups and to deliver on time to apply the principles of management
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Understanding management and its types 2. Stages of development of administration and its schools 3. Acquisition of knowledge of administrative work and knowledge of management levels 4. The importance of using management principles to manage any project in all medical, engineering and other specializations 5. Gaining knowledge of administrative dealings, its levels, and the importance of the leader 6. The importance of electronic management and benefit from the development in management
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. Basic concepts of management, its types and elements [2 hours] Identifying the difference between administrative and executive work, types of management and manager levels [2 hours] Historical development and schools of management thought Director roles and its development [2 hour], knowing the difference between the two departments [1 hour], sub-administrative functions in public administration, and the concept of the system [1 hours], centralization and decentralization of the organizational structure and the difference between them, planning and its types [2 hours] Authority and responsibility Leadership theories and leadership behavior patterns [2 hours], preparing a report [2 hour], electronic management and obstacles [2 hours]

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The main strategy that you will adopt in presenting this unit is to develop students' skills in research and familiarity with the concept of management and its importance. It has a curriculum in all areas of life and its importance, levels and administrative, and the reason for career progression and the reasons for an administrative model for students to present different topics related to their

	specialization and write a report on the view of automation in the fields of engineering. homework way

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	1.13
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**50**		

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

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Introduction to concept of management and its importance and elements
Week 2	Identify the types of management, their levels and skills, the manager and his levels, and the functions related to management
Week 3	Historical development and schools of administrative thought Director roles
Week 4	The difference between public administration and business administration
Week 5	Sub-administrative jobs in the public administration
Week 6	The concept of the system and its components
Week 7	Centralization and decentralization of the organizational structure and the difference between them

Week 8	Learn about planning and its importance in any business
Week 9	The concept of decision-making, its importance, the factors affecting it and its patterns
Week 10	The concept of decision-making, its importance, the factors affecting it and its patterns
Week 11	Authority and responsibility Leadership theories and leadership behavior patterns
Week 12	Differentiate between e-business, e-management and e-government
Week 13	Types of networks used and elements of electronic management
Week 14	The importance of electronic administration and the networks used
Week 15	Obstacles to electronic management

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

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Management Principles / Dr. Shawqi Naji Jawad Business Administration Principles / Dr. Khalil Al-Shamaa : Dr. Ahmed Al-Shammari & others, Principles of Business Administration, Obeikan Library. . Assistant Professor Alaa Daham Hamad Principles of Administration University of Baghdad / College of Administration and Economics Electronic management / Raafat Radwanhttp://www.diwanalarab.com	No
Recommended Texts		No
Websites	"Business Management", www.encyclopedia.com, Retrieved 2018-4-8. Edited. 2. ↑ “management”, www.businessdictionary.com, Retrieved 2018-4-8. Edited by Agadir Al-Aidarous, Introduction to Management 4. ↑ Omar Dora, Introduction to Management. Kimberlee Leonard (3-13-2018), “Five Functions of Management & Leading”, smallbusiness.chron.com, Retrieved 4-12-2018. Edited. Muhammad Bakri Abdel-Aleem (2007), Principles of Business Administration, Egypt: Benha University. “Importance of Management”, www.managementstudyguide.com, Retrieved 8-12-2018. Edited 8. “6 Types of Management Styles”, online.grace.edu, Retrieved 9-11-	

	2018. Edited 9. “Levels of Management”, www.managementstudyguide.com, Retrieved 8-12-2018.

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

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

MODULE DESCRIPTION FORM
نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	Analytic Mathematics			**Module Delivery**	
Module Type	Basic			☒ **Theory** ☒ **Lecture** **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	CREMAT4				
ECTS Credits	5				
SWL (hr/sem)	125				
Module Level	2		**Semester of Delivery**	4	
Administering Department	Type Dept. Code		**College**	Type College Code	
Module Leader	Dr. Alhuda A. Oied		**e-mail**		
Module Leader's Acad. Title	Assist. Professor		**Module Leader's Qualification**	Ph.D.	
Module Tutor	Dr. Alhuda A. Oied		**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. The lecture aims to improve students' mathematical literacy and communication skills. They should be able to read and interpret mathematical notation, formulas, and graphs 2. The math lecture aims to develop students' critical thinking and problem-solving skills through mathematical exercises and applications. Students should be able to analyze engineering problems

	3. Familiarize with vectors and matrices: Vectors and matrices play a crucial role in civil engineering, particularly in structural analysis and linear systems.. 4. Students should be able to apply calculus techniques to solve engineering problems, such as finding rates of change, determining areas and volumes, and analyzing the behavior of variables.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	6. CLO-1: Understanding numerical methods and computational tools such as matrix method and series. 7. CLO-2: Students should be able to analyze and model civil engineering systems such as engineering applications. 8. CLO-3: Students should be able to present mathematical derivations, analyses, and results in a clear and concise manner to engineering audiences. 9. CLO-4: Students should understand the limitations and assumptions associated with mathematical models used in civil engineering. By applying initial conditions and boundary conditions 10. CLO-5: Students should be able to understand and apply mathematical principles, such as calculus linear algebra, and probability theory, to solve engineering problems related to civil engineering.
Indicative Contents المحتويات الإرشادية	Separation of variables Fundamental solutions and superposition of solutions of PDE Euler-Fourier formulas The Fourier Convergence Theorem Even and odd functions; sine and cosine series Homogeneous Dirichlet boundary conditions Mid exam 1 Nonhomogeneous boundary conditions steady-state solutions D'Alembert's solution of the initial value problem Energy integrals for the wave equation Boundary value problems in polar coordinates Lagrange's identity and consequences Eigenvalues and eigenfunctions Mid exam 2

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	78	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	5
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	47	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	3.1
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)	Cont.	All
	Online Assignments	2	10% (10)	Cont.	All
	Onsite Assignments	2	10% (10)	Cont.	All
	Projects / Lab.	1	10% (10)	Cont.	All
Summative assessment	**Midterm Exam**	2hr	20% (20)	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	Separation of variables
Week 2	Fundamental solutions and superposition of solutions of PDE
Week 3	Euler-Fourier formulas
Week 4	The Fourier Convergence Theorem
Week 5	Even and odd functions; sine and cosine series
Week 6	Homogeneous Dirichlet boundary conditions
Week 7	Mid exam 1
Week 8	Nonhomogeneous boundary conditions
Week 9	steady-state solutions
Week 10	D’Alembert’s solution of the initial value problem
Week 11	Energy integrals for the wave equation

Week 12	Boundary value problems in polar coordinates
Week 13	Lagrange’s identity and consequences
Week 14	Eigenvalues and eigenfunctions
Week 15	Mid exam 2

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

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Thomas' Calculus, 12th Edition" by George B. Thomas Jr., Maurice D. Weir,	Yes
Recommended Texts	Engineering Mathematics" by K.A. Stroud and Dexter J. Booth:	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

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MODULE DESCRIPTION FORM
نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	Electronic Circuits			**Module Delivery**	
Module Type	Core			☒ **Theory** ☐ **Lecture** ☒ **Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	LAER220				
ECTS Credits	6				
SWL (hr/sem)	150				
Module Level	2		**Semester of Delivery**	4	
Administering Department	Type Dept. Code		**College**	Type College Code	
Module Leader	Jalal Abdulla Khalaf		**e-mail**	Jalal.a.khalaf@nahrainuniv.edu.iq	
Module Leader's Acad. Title	Lecturer		**Module Leader's Qualification**	MS.C	
Module Tutor	Dr. Shahad Emad		**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	LAER 120	**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 first objective is to give students fundamentals basic electronics elements using FET transistor, op-amp amplifier, and to learn who to design electronics circuits.**
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Understand fundamental electronic concepts and theories, including Ohm's Law, Kirchhoff's Laws, and circuit analysis. 2. Identify commonly used electronic components such as resistors, capacitors, diodes, transistors, and operational amplifiers, and understand their functions and applications. 3. Analyze and design basic electronic circuits using appropriate circuit

	simulation software. 4. Construct, test, troubleshoot, and repair electronic circuits using standard electronic testing equipment. 5. Understand the concept of signal amplification and the applications of operational amplifiers in signal processing circuits. 6. Understand the principles of power electronics, including rectifiers, filters, and voltage regulators. 7. Apply knowledge of electronics to solve practical problems related to current and emerging electronic technologies.
Indicative Contents المحتويات الإرشادية	BJT Ac Analysis, Amplification In Ac Domain,The re Transistor Model, Commun-Emitter Configuration , Commun- Base Configuration (8hrs) Collector Feedback Configuration, Emitter – Follower Cofiguration, Commun- Base Configuration, Miscellaneous Bias Configuration (4hrs) Effect Of RL And Rs, Determine The Current Gain (4hrs) Field – Effect Transistors, Construction And Characteristics of JFETs, Transfer Characteristics, (4hrs) Depletion-Type MOSFET , Basic Construction, Basic Operation and Characteristics, P -Channel Depletion-Type MOSFET(4hrs) Fet Biasing, Fixed-Bias Configuration, Self-Bias Configuration (4hrs) Voltage-Divider Biasing, Common-Gate Configuration , Depletion-Type MOSFETs (4hrs) FET Amplifier, JFET Small-Signal Model , JFET Ac Equivalent Circuit, Fixed-Bias Configuration(4hrs) Self-Bias Configuration, Voltage-Divider Configuration, Common-Gate Configuration (4hrs) Depletion-Type MOSFETs (4hrs) Operational Amplifier, Op-Amp Basics, Inverting Amplifier, Noninverting Amplifier, Unity Follower, Summing Amplifier, Integrator, Differentiator(8hrs) Op-Amp Applications, Multiple-Stage Gains, Voltage Summing , Voltage Subtraction (8hrs)

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	6
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	57	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	3.8
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**150**		

Module Evaluation
تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	2	10% (10)	5 and 10	LO #1, #2 and #10, #11
	Online Assignments	2	5% (10)	2 and 12	LO #3, #4 and #6, #7
	Onsite Assignments	2	5% (10)	2 and 12	LO #3, #4 and #6, #7
	Projects / Lab.	3	10% (10)	Continuous	All
	Report	2	10% (10)	13	LO #5, #8 and #10
Summative assessment	**Midterm Exam**	2hr	10% (10)	7,13	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	BJT Ac Analysis, Amplification In Ac Domain,The re Transistor Model, Commun- Emitter Configuration , Commun- Base Configuration
Week 2	Collector Feedback Configuration, Emitter – Follower Cofiguration, Commun- Base Configuration, Miscellaneous Bias Configuration
Week 3	Effect Of RL And Rs, Determine The Current Gain
Week 4	Field – Effect Transistors, Construction And Characteristics of JFETs , Transfer Characteristics ,
Week 5	Depletion-Type MOSFET , Basic Construction, Basic Operation and Characteristics, P -Channel Depletion-Type MOSFET
Week 6	Fet Biasing, Fixed-Bias Configuration , Self-Bias Configuration
Week 7	Midterm Exam 1
Week 8	Voltage-Divider Biasing , Common-Gate Configuration , Depletion-Type MOSFETs
Week 9	FET Amplifier, JFET Small-Signal Model , JFET Ac Equivalent Circuit, Fixed-Bias Configuration
Week 10	Self-Bias Configuration , Voltage-Divider Configuration, Common-Gate Configuration

Week 11	Depletion-Type MOSFETs
Week 12	Operational Amplifier , Op-Amp Basics , Inverting Amplifier, Noninverting Amplifier, Unity Follower, Summing Amplifier, Integrator, Differentiator
Week 13	Operational Amplifier , Op-Amp Basics , Inverting Amplifier, Noninverting Amplifier, Unity Follower, Summing Amplifier, Integrator, Differentiator cont.
Week 14	Midterm Exam 2
Week 15	Op-Amp Applications, Multiple-Stage Gains, Voltage Summing , Voltage Subtraction cont.

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: input and output characteristics of commun-emitter configuration of transistors
Week 2	Lab 2: Bipolar junction transistor amplifier and gain
Week 3	Lab 3: JFET circuits characteristics
Week 4	Lab 4: JFET circuits and applications
Week 5	Lab 5: operational amplifier (Op-Amp)(inverter and non-inverter)
Week 6	Lab 6:

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	**Electronic Devices and Circuit Theory, by Robert Boylestad and Louis Nashelsky, 1988published by Prentic-Hall International(UK) Limited**	
Recommended Texts	- **Electrical Engineering Principles and Applications, by ALLAN R . HAMBLELY, Third Edition, Pearson Education International, 2005 McGraw-Hill, 1985**. - **Electrical Technology, by B. L Theraja, S Chand & Company LTD, 2009**	
Websites		

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks %**	**Definition**
Success Group (50 - 100)	**A -** Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings

	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX –** Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

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

MODULE DESCRIPTION FORM
نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	Digital Combinational Systems			**Module Delivery**	
Module Type	Core			☒ **Theory** ☐ **Lecture** ☒ **Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	LAER221				
ECTS Credits	6				
SWL (hr/sem)	150				
Module Level	2		**Semester of Delivery**	4	
Administering Department			**College**		
Module Leader	Ali Adnan Khalil		**e-mail**	ali.a.al-temeemy@nahrainuniv.edu.iq	
Module Leader's Acad. Title	Asst. Professor		**Module Leader's Qualification**	Ph.D.	
Module Tutor	Marwa Ali		**e-mail**		
Peer Reviewer Name			**e-mail**		
Scientific Committee Approval Date			**Version Number**		

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

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	1. To develop problem solving skills and understanding of combinational logic circuits. 2. To understand number systems, operations, and codes. 3. This course deals with the basic concept of digital circuits. 4. To understand logic gates, Boolean Algebra, and logic simplifications. 5. To understand combinational logic analysis and their functions including adders, comparators, Encoders/Decoders, Multiplexers/Demultiplexers, and Parity Generators/Checkers.

Module Learning Outcomes مخرجات التعلم للمادة الدراسية	This course tends to provide the student with fundamentals of digital technology, design, and functions of combinational logic circuit. 1. Explain the difference between digital and analog quantities. 2. Count in the binary, hexadecimal, binary coded decimal number systems. 3. Convert between number systems and apply arithmetic operations. 4. Convert between the binary system and the Gray code and Interpret the American Standard Code for Information Interchange (ASCII). 5. Describe the operation of the inverter, AND, OR, NAND, NOR gates with Boolean algebra. 6. Apply the basic laws and rules of Boolean algebra and DeMorgan's theorems. 7. Describe, evaluate, convert, and simplify Boolean expressions. 8. Use a Karnaugh map to simplify Boolean expressions and truth table functions. 9. Analyze basic combinational logic circuits, such as AND-OR, AND-OR-Invert, exclusive-OR, and exclusive-NOR. 10. Use adders for arithmetic operations and the magnitude comparator to determine the relationship between two binary numbers. 11. Use BCD-to-7 -segment decoders in display systems and apply a decimal-to-BCD priority encoder in a simple keyboard application. 12. Apply Multiplexers/Demultiplexers in data selection, and simple communications systems. 13. Explain the meaning of parity generators and checkers to detect bit errors in digital systems.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. <u>Digital Concepts</u> Introduction to Digital System, Digital and Analog Quantities. [1 hrs] <u>Number Systems, Operations, and Codes</u> Decimal and Binary Numbers, Decimal and Binary Conversions, Binary Arithmetic, 1's and 2's Complement of Binary Numbers, Singed Numbers and their Arithmetic Operations, Hexadecimal and Octal Numbers, BCD and Digital Codes. [11 hrs] <u>Logic Gates</u> The Inverter, The AND Gate, The OR Gate, The NAND Gate, The NOR Gate, The Exclusive-OR and Exclusive-NOR Gates. [3 hrs] <u>Boolean Algebra and Logic Simplifications</u>

	Boolean Operations and Expressions, Laws and Rules of Boolean Algebra, DeMorgan`s Theorem, Simplification using Boolean Algebra, Standard Forms of Boolean Expressions and Truth Tables, Karnaugh Map and SOP/POS Minimization. [13 hrs] <u>Combinational Logic Analysis</u> Basic Combinational Logic Circuits and their implementation, Universal Properties of NAND and NOR Gates, and their use in Combinational Logic, Logic Circuit Operation with pulse Waveforms. [3 hrs] <u>Functions of Combinational Logic</u> Basic and Parallel Binary Adders, Comparators, Decoder, Encoder, Code Converters, Multiplexers, Demultiplexers, Parity Generators/Checkers. [12 hrs] Revision problem classes. [3 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	93	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	6
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	57	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	3.8
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**150**		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	5	10% (10)	Continuous	All

	Assignments	2	10% (10)	12 and 15	LO #8, #10 and #11, #13
	Projects / Lab.	6	10% (10)	Continuous	LO #1 - #10
	Report	6	10% (10)	Continuous	LO #1 - #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	Introduction to Digital System, Digital and Analog Quantities, Decimal Numbers
Week 2	Binary Numbers, Decimal and Binary Conversions, Binary Arithmetic
Week 3	1's and 2's Complement of Binary Numbers, Singed Numbers and their Arithmetic Operations
Week 4	Hexadecimal and Octal Numbers, BCD and Digital Codes.
Week 5	The Inverter, The AND Gate, The OR Gate, The NAND Gate, The NOR Gate, The Exclusive-OR and Exclusive-NOR Gates
Week 6	Boolean Operations and Expressions, Laws and Rules of Boolean Algebra, DeMorgan`s Theorem, Simplification using Boolean Algebra
Week 7	Mid-term Exam + Standard Forms of Boolean Expressions
Week 8	Boolean Expressions and Truth Tables
Week 9	The Karnaugh MaP, Karnaugh Map SOP Minimization
Week 10	Karnaugh Map POS Minimization
Week 11	Basic Combinational Logic Circuits and their implementation, Universal Properties of NAND and NOR Gates, and their use in Combinational Logic, Logic Circuit Operation with pulse Waveforms.
Week 12	Basic and Parallel Binary Adders
Week 13	Comparators, Decoder
Week 14	Encoder, Code Converters
Week 15	Multiplexers, Demultiplexers, Parity Generators/Checkers
Week 16	**Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1-3	Lab 1: Logic Gates
Week 4-6	Lab 2: Combinational Logic Circuits

Week 7-9	Lab 3: Karnaugh Maps
Week 10-11	Lab 4: Code Conversion
Week 12-13	Lab 5: Basic Arithmetic Operations
Week 14-15	Lab 6: Comparators

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Digital Fundamentals, by Thomas L. Floyd, Eighth Edition, 2003.	Yes
Recommended Texts	Digital Fundamentals, by Thomas L. Floyd, Eleventh Edition, 2014.	No
Websites		

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

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

MODULE DESCRIPTION FORM
نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Laser Physics**			**Module Delivery**	
Module Type	Basic			☒ **Theory** ☐ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	LAER222				
ECTS Credits	6				
SWL (hr/sem)	150				
Module Level	2		**Semester of Delivery**	4	
Administering Department	LAER		**College**	Type College Code	
Module Leader	Dr. Fatema H. Rajab		**e-mail**	Fatema.h.rajab@nahrainuniv.edu.iq	
Module Leader's Acad. Title	Assist. Prof.		**Module Leader's Qualification**	Ph.D.	
Module Tutor	Dr. Fatema H. Rajab		**e-mail**	Fatema.h.rajab@nahrainuniv.edu.iq	
Peer Reviewer Name	Name		**e-mail**	E-mail	
Scientific Committee Approval Date	01/06/2023		**Version Number**	1.0	

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

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	1. To give students fundamentals of Laser Physics, i.e., propagation of laser beam , emission and absorption of laser radiation 2. This course plans to give students fundamental subjects and articles of Laser Physics , i.e., measuring laser bandwidths , broadening mechanism, measuring the outputs of pulsed laser, semi-classical theory, laser oscillation, threshold, gain, Q-switching.
Module Learning Outcomes	1. Understand the principles of laser operation, and solve basic equation of resonator stability 2. Solve basic equations related to Gaussian beam propagation in a free space

مخرجات التعلم للمادة الدراسية	to predict the beam waist, position and radius of curvature in terms of distance and cavity geometry. 3. Solve basic laser equations, such as rate equations and cavity modes, to predict laser behavior and design laser systems. 4. The ability to calculate and manipulate laser parameters such as laser power, pulse duration, and repetition rate, and to design laser systems that meet specific performance requirements. 5. Understanding the laser spectralwidth, its causes and methods of its reducing and a methods of generating single mode lasers with solve basic equations. 6. Understanding the methods of creating short pulse lasers 7. An understanding of the fundamental principles behind laser technology, including the differences between gas, solid-state, and semiconductor lasers with broader understanding of the role that lasers play in scientific research, medicine, and industry.
Indicative Contents المحتويات الإرشادية	• Laser Resonators and Stability: basic components of laser system, optical resonator, passive optical resonator, types of resonator, stability of laser resonator, fapry-perot resonator, (8 hrs) • Gaussian Beam Propagation: free sapace propagation of Gaussian beam, standing waves, transverse and longitudinal modes, calculation of beam waist size, radius of curvature and position in the cavity (6 hrs) • Rate Equations: The rate equations in two, three and four energy levels (2hrs) • Laser oscillation: Gain, loop gain, losses, threshold condition, power emitted by laser (4 hrs) • Spectral Linewidth: what is the spectralwidth, broadening techniques or mechanisms critical population inversion, reducing the laser bandwidth, single mode laser, (6 hrs) • Types of laser outputs: Continues and pulses lasers, peak and average power, measuring the output of pulse lasers (pulse width, energy, fluence and power intensity, duty cycle (4hrs) • Laser Pulse Forming: Free running, Q-switching, methods of Q-switching, quality factor, power and energy of Q-switching, mode locking, power and energy of Mode locking, mechanisms of mode locking (8 hrs) • Types of Lasers: solid state lasers, ruby laser, Nd:YAG laser, Nd:Glass laser, alexandirate laser, Ti:Sapphire laser Fiber laser, gas lasers, atomic lasers, ionic lasers, metal vapor lasers, molecular lasers, polarization of light, dye lasers, semiconductor lasers, free electron lasers (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	78	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	5
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	72	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	4.8
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**150**		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	4	10% (10)	Cont.	All
	Online Assignments	3	8% (10)	Cont.	All
	Onsite Assignments	2	8% (10)	Cont.	
	lab	2	6% (10)	Cont.	All
	Reports	4	8% (10)	Cont.	All
Summative assessment	**Midterm Exam**	2hr	10% (10)	7	All
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Laser Resonators and Stability
Week 2	Gaussian Beam Propagation
Week 3	Laser Systems Rate Equations
Week 4	Laser oscillation
Week 5	Laser oscillation Cont.
Week 6	Spectral Linewidth, Laser Broadening Mechanisms.
Week 7	Midterm Exam #1

Week 8	Reducing Laser Bandwidth Methods, Single Mode Laser.
Week 9	Types of Laser Outputs: Measuring the Outputs of Lasers.
Week 10	Laser Pulse Forming: Free Running, Q-switching, Mode locking.
Week 11	Laser Pulse Forming: Free Running, Q-switching, Mode locking Cont.
Week 12	Laser Pulse Forming: Free Running, Q-switching, Mode locking Cont.
Week 13	Types of Lasers
Week 14	Types of Lasers Cont.
Week 15	Types of Lasers Cont.

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: Glossary to Laser Terms and Laser Safety
Week 2	Lab 2: Laser Beam Divergence angle
Week 3	Lab 3: Spectrum of Light
Week 4	Lab 4: Laser Beam Diffraction
Week 5	Lab 5:Measuring the Wavelength of Laser with a Simple Ruler
Week 6	Lab 6: Measuring the Wavelength of Laser Using Diffraction Phenomenon
Week 7	Lab 7: Measuring the Wavelength of Laser Using Diffraction Phenomenon cont.
Week 8	Lab 8: Measuring the Laser Bandwidth using Optical Spectrum Analyser (OSA)
Week 9	Lab 9: Gaussian Distribution
Week 10	Lab 10: Adjusting and Starting the He:Ne Laser System
Week 11	Lab 11: Michelson Interferometer
Week 12	Lab 12: Laser Power and the Discharge Current
Week 13	Lab 13: Polarization of Light
Week 14	Lab 14: Polarization of Light cont.

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	2. LASERS *Anthony E. Siegman*	
Recommended Texts	1. LASERS or LASER PHYSICS *PETER W. MILONNI* *JOSEPH H. EBERLY* 3. Solid-State Lasers: A Graduate Text *Walter Koechner* &*Michael Bass* 4. Principles of Laser Materials Processing *Elijah Kannatey-Asibu, Jr.*	
Websites		

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

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

MODULE DESCRIPTION FORM
نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	Laser Safety			**Module Delivery**	
Module Type	Core			☒ **Theory** ☐ **Lecture** ☐ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	LAER223				
ECTS Credits	2				
SWL (hr/sem)	50				
Module Level	2		**Semester of Delivery**	4	
Administering Department	Type Dept. Code		**College**	Type College Code	
Module Leader	Wurood A. Khaleel		**e-mail**	Wurood.a.khaleel@nahrainuniv.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	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 objective of learning laser safety aim to promote awareness, understanding, and responsible use of lasers to reduce the risks of injury, damage, or harm associated with laser technology.

Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Understanding the basic principles of technology including the properties of laser light, laser classifications, and laser hazards. 2. Understanding the different types of laser hazards and the potential risk factors associated with each type of hazard, including skin and eye injuries, burns, and fire hazards. 3. Understanding the different types of protective and safety measures required to minimize the risk of laser hazards, including personal protective equipment, engineering and administrative controls 4. Developing skills and knowledge in laser safety procedures, including how to properly handle and use lasers, how to deal with emergencies, and how to respond to accidental exposures
Indicative Contents المحتويات الإرشادية	**Basic concepts** (electromagnetic spectrum, the basic laser terminology , fundamentals of lasers, the characteristics of laser light, how a laser works and common lasers) (2hrs). **Non-beam hazards:** non-beam hazards associated with industrial lasers include electrical hazards from laser power supply and fire hazards) (2hrs) **Laser classes:** all lasers are classified according to the level of laser radiation that is accessible during normal operation. According to the American National standards for safe use of laser ANSIZ136.1 lasers can be classified into seven laser hazard classes (2hrs). **Eye injury:** Exploration of the parts of eye and type of injuries that can occur to the various parts of eye based on the type of laser (2hrs). **Skin injury:** summary of laser effect on skin tissue (2hrs). **Laser hazard evaluation:** explains hazard evaluation term such as maximum permissible exposure (MPE), nominal hazard zone (NHZ) and optical density (OD) (2hrs). **Control measures:** include both administrative controls and engineering controls (3hrs).

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The main strategy that will be adopted in delivering this module is to teach students' how to avoid burns, eye injuries and other laser-related hazards. At the same time learn the main control measures. This will be achieved through classes, interactive tutorials and by considering types of simple 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	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	1.1

Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**50**

Module Evaluation
تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	2	10% (10)	5 and 10	LO #1, #2 and #10, #11
	Assignments	2	10% (10)	2 and 12	LO #3, #4 and #6, #7
	Classroom activities	1	10% (10)	Continuous	All
	Report	1	10% (10)	13	LO #5, #8 and #10
Summative assessment	**Midterm Exam**	2hr	10% (10)	7,13	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	Basic concepts
Week 2	Basic concepts cont.
Week 3	Non-beam hazards
Week 4	Non-beam hazards cont.
Week 5	Laser classes
Week 6	Laser classes cont.
Week 7	Midterm Exam 1
Week 8	Eye injury
Week 9	Skin injury
Week 10	Skin injury cont.
Week 11	Laser hazard evaluation
Week 12	Laser hazard evaluation cont.
Week 13	Midterm Exam 2
Week 14	Control measures
Week 15	Control measures cont.

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts		

Recommended Texts	1. "Laser Safety Manual" by Laser Institute of America (LIA) 2. ANSI Standard Z136.1-2007, American National Standard for the Safe Use of Lasers, 2007 3. "Guide for Laser Safety" by Occupational Safety and Health Administration (OSHA) 4. "Laser Safety - A Practical Approach" by Patrick Murphy	
Websites		

Grading Scheme
مخطط الدرجات

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

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

MODULE DESCRIPTION FORM
نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	Engineering and Numerical Analysis			**Module Delivery**	
Module Type	Basic			☒ **Theory** ☐ **Lecture** ☐ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	CERMAT5				
ECTS Credits	5				
SWL (hr/sem)	125				
Module Level	3		**Semester of Delivery**	5	
Administering Department			**College**		
Module Leader	Wurood A Khaleel Rana M. Taha		**e-mail**	Wurood.a.khaleel@nahrainuniv.edu.iq Rana.m.taha@nahrainuniv.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	CERMATH1	**Semester**	1
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. Identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics 2. Ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, considering the impact of engineering solutions in global, economic, and environment. 3. Ability to function effectively on a team to provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives 4. Develop the thinking skills student's imagination ability and the ability to express and transfer the ideas in the form of geometric structures. 5. The ability to add knowledge in the area of simple analysis of structures using principles of engineering and mathematic theories.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Understanding and learn the theories and methods used in solving mathematical problems using numerical methods. 2. Ability to analyze evaluates, and expands mathematical equations using appropriate numerical techniques and methods. 3. Students should understand the concepts of interpolation and divergence and be able to determine interpolated series of points numerically. 4. Students should be able to work with approximation of determination function from series of points, and using them to represent functions. 5. Students should understand the relationship between numerical solution and calculus, including the use of Taylor and Maclaurin series to approximate functions. 6. Students should be able to solve simultaneous linear equations using numerical approaches. 7. Students should be able to solve problems in areas such as numerical differentiation, integration and differential equations using different methods.

Indicative Contents المحتويات الإرشادية	• Operators –finite differences, average, differential, etc., their inter-relations. Difference of polynomials. Difference equation (6hrs). • Numerical solution of Nonlinear Equations, Bisection method, fixed-point iteration, Newton's method (6hrs). • Forward and backward iteration, Error analysis for Iterative Methods (6hrs). • Computing roots of polynomials(6hrs). • Interpolation and Polynomial Approximation, Lagrange Polynomial(6hrs). • Numerical integration and differentiation, Simpson rule, Trapezoidal rule, etc., Gaussian quadrature and Euler-Maclaurin formula(6hrs). • Euler's, Taylor, Runge-Kutta and its modified, and multistep methods, Stability (6hrs). • Least square approximation (6hrs). • Differentiation. Lagrange's method. Gauss-quadrature. (6hrs). • Degree of precision. Gauss-Legendre and Gauss-Chebyshev methods. Double integration. Monte-Carlo method. (6hrs). • Partial differential equation. Finite-difference approximation. Explicit methods. Crank-Nicolson method. (6hrs). • Parabolic, hyperbolic and elliptic equation. Stability. (6hrs). • Bessel function, properties and modified Bessel function(6hrs). • Finite element method for one dimensional(6hrs).

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	• Teaching students to definition of Numerical solutions • Encourage students' participation in the exercises, and assignments • expanding their critical thinking skills. This will be achieved through classes, interactive tutorials and by considering types exercises and some sampling activities that are interesting to the students. • Practice testing (short question answers and exams).

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	78	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	5
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	47	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	3.1
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 #2, #3 and #4, #5
	Assignments	3	10% (10)	2 ,7, 12	LO #1, #2, and #6, #7
	Tutorial	1	10% (10)	Continuous	All
	Exam	1	10% (10)	6	LO #2-4 and #6, #7
Summative assessment	**Midterm Exam**	2hr	10% (10)	10	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	Operators –finite differences, average, differential, etc., their inter-relations. Difference of polynomials. Difference equation.
Week 2	Numerical solution of Nonlinear Equations, Bisection method, fixed-point iteration, Newton's method.
Week 3	Forward and backward iteration, Error analysis for Iterative Methods
Week 4	Computing roots of polynomials.
Week 5	Interpolation and Polynomial Approximation, Lagrange Polynomial
Week 6	Numerical integration and differentiation, Simpson rule, Trapezoidal rule, etc., Gaussian quadrature and Euler-Maclaurin formula.
Week 7	Mid exam 1
Week 8	Euler's, Taylor, Runge-Kutta and its modified, and multistep methods, Stability
Week 9	Least square approximation
Week 10	Differentiation. Lagrange's method. Gauss-quadrature. Degree of precision. Gauss-Legendre and Gauss-Chebyshev methods. Double integration. Monte-Carlo method.
Week 11	Partial differential equation. Finite-difference approximation. Explicit methods. Crank-Nicolson method.
Week 12	Parabolic, hyperbolic and elliptic equation. Stability.
Week 13	Bessel function, properties and modified Bessel function
Week 14	Finite element method for one dimensional
Week 15	Mid exam 2

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: Error Analysis: Accuracy and Stability
Week 2	Lab 2: Solution of Nonlinear Equations I
Week 3	Lab 3: Solution of Nonlinear Equations II
Week 4	Lab 4: Analysis of Nonlinear Circuits
Week 5	Lab 5: Polynomial Interpolation
Week 6	Lab 6: Spline Interpolation

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Numerical Methods by R. W. Hown book	Yes
Recommended Texts	Basic Numerical Methods by R. E. Sowaton	Yes
Websites		

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

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

MODULE DESCRIPTION FORM
نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Quantum Technologies**			**Module Delivery**	
Module Type	Core			☒ **Theory** ☐ **Lecture** ☐ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	LAER310				
ECTS Credits	4				
SWL (hr/sem)	100				
Module Level	3		**Semester of Delivery**	5	
Administering Department	Type Dept. Code		**College**	Type College Code	
Module Leader			**e-mail**		
Module Leader's Acad. Title	Assist Prof.		**Module Leader's Qualification**	Ph.D.	
Module Tutor	Name (if available)		**e-mail**	E-mail	
Peer Reviewer Name	Name		**e-mail**	E-mail	
Scientific Committee Approval Date	01/06/2023		**Version Number**	1.0	

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

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	**The objective is to define the wave function and explain what the differences between it and the classical mechanics, and explain the energy levels, potential energy, Bohr theory of atoms, and their applications.**
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Understanding the foundations of quantum mechanics: This includes understanding the principles of superposition, measurement, and entanglement. 2. Solving quantum mechanical problems: This includes solving problems

	related to the time evolution of quantum systems, calculating probabilities, and understanding the behavior of simple quantum systems. 3. Understanding the mathematical formalism of quantum mechanics: This includes understanding the wave function, operators, and the Schrödinger equation. 4. Understanding the applications of quantum mechanics: This includes understanding the role of quantum mechanics in modern technology, such as quantum computing and quantum cryptography. 5. Understanding the interpretation of quantum mechanics: This includes understanding the different interpretations of quantum mechanics, such as the Copenhagen interpretation and the many-worlds interpretation. Overall, the module learning outcomes of quantum mechanics aim to provide students with a deep understanding of the fundamental principles of quantum mechanics and their applications in modern physics and technology.
Indicative Contents المحتويات الإرشادية	**Physical Foundations of Quantum Mechanic:** Introduction, Quantum mechanics (Q.M), The needs of Q.M, Phenomenon couldn't be interpreted by classical physics, Black body radiation, Atom stability, Photo electric effect, Natural duality of matter and radiation, Uncertainty principle, Correspondence principle (12hrs) **Elementary Properties of Quantum Mechanics:**Introduction, Wave function and its interpretation, Mathematical interpretation of the wave function**,** Derivation of Schrödinger wave equation, Operators, Operators properties, Operator equation, Eigen value equation, Eigen value and eigen functions, Observables, Expectation values, Variance, Equation of motion and constant of motion, Degeneracy, Conservation of probability and probability current density, Quantized states, Parity (12hrs) **Simplified quantum systems:** Introduction, Free particle, Schrödinger equation in one dimension, Potential step (finite and infinite height), Particle in a box in one dimension, Particle in a box in three dimension, Density of states, Potential barrier penetration, Potential well (12hrs) **Simple Harmonic Oscillator:** Introduction**,** Hamiltonian Function, Solution of Schrödinger equation, Analytical treatment (energy eigen values and eigen wave functions), Operator treatment (energy eigen values and eigen wave functions), Comparison with classical theory (9hrs)

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	48	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	3
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	52	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	3.4
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% (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)	7,13	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	Chapter One (physical foundations of Quantum Mechanics)
Week 2	Chapter One (physical foundations of Quantum Mechanics)
Week 3	Chapter One (physical foundations of Quantum Mechanics)
Week 4	Chapter One (physical foundations of Quantum Mechanics)
Week 5	Chapter Two (Elementary Properties Of Quantum Mechanics)
Week 6	Chapter Two (Elementary Properties Of Quantum Mechanics)
Week 7	Midterm Exam 1
Week 8	Chapter Two (Elementary Properties Of Quantum Mechanics)
Week 9	Chapter Three (Simplified Quantum Systems)
Week 10	Chapter Three (Simplified Quantum Systems)

Week 11	Chapter Three (Simplified Quantum Systems)
Week 12	Chapter Three (Simplified Quantum Systems)
Week 13	Midterm Exam 2
Week 14	Chapter Four (Simple Harmonic Oscillator)
Week 15	Chapter Four (Simple Harmonic Oscillator)

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

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	**LASER FUNDAMENTALS, BY WILLIAM T. SILFVAST, 2ND EDITION, CAMBRIDGE UNIVERSITY PRESS, 2004.**	
Recommended Texts		
Websites		

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

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

MODULE DESCRIPTION FORM
نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Optoelectronics**			**Module Delivery**	
Module Type	Core			☒ **Theory** ☐ **Lecture** ☐ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	LAER311				
ECTS Credits	4				
SWL (hr/sem)	100				
Module Level	3		**Semester of Delivery**	5	
Administering Department	Type Dept. Code		**College**	Type College Code	
Module Leader	Bassam Ghalib Rasheed		**e-mail**	dr_bassamghalib@yahoo.com	
Module Leader's Acad. Title	Professor		**Module Leader's Qualification**	Ph.D.	
Module Tutor	Name (if available)		**e-mail**	E-mail	
Peer Reviewer Name	Name		**e-mail**	E-mail	
Scientific Committee Approval Date	01/06/2023		**Version Number**	1.0	

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

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	**Firstly giving students primary concepts of semiconductors , band theory, doping (ion implantation),direct and indirect gaps , recombination of electrons and holes, fabrication of semiconductor materials, double hetrojunction, light emitting diode, introducing the basic design of the laser diode; The other objective is to explain some applications for LD ,optoelectronic effects and applications .**

Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Understand the basics of light-matter interaction and energy transfer mechanisms. 2. Explain the principles of semiconductors and optoelectronic devices, and their applications. 3. Describe the physics of photodetectors, LEDs, lasers, solar cells, and other optoelectronic systems. 4. Evaluate the performance of optoelectronic devices and systems by using advanced measurement and analysis techniques. 5. Develop skills for designing and modeling optoelectronic components and systems. 7. Explore emerging trends and new developments in the field of optoelectronics. Overall, the module is designed to provide students with a comprehensive understanding of the fundamentals, applications, and research areas in optoelectronics. This knowledge is essential for many advanced technologies, including telecommunications, photonics, imaging, energy conversion, and sensing applications.
Indicative Contents المحتويات الإرشادية	**CHAPTER ONE (Fundamentals of optoelectronics):** Basics of semiconductors, junction, Homojunction, Hetrojunction, junction width, junction barrier, junction I-V characteristics (6hrs) **CHAPTER TWO (Optoelectronics Devices):** Light emitters, Light detectors, Forward biasing, reverse biasing, energy band diagram (6hrs). **CHAPTER THREE (Light Emitters):** Light emitting diode, I-V characteristics, Material and control the emitting wavelength, Quantum efficiency, Surface emitting, Edge emitting, Rate equation. Laser Diode, Modes (longitudinal, transverse and lateral), laser threshold gain, threshold gain, External quantum efficiency (6hrs). **CHAPTER FOUR (Detector):** Types of Detector, Photodiodes, phototransister, photomultiplier, Avalanche detector, Light Emitting Device (LED), structure, solar cells, solar cell generations (6hrs). **CHAPTER FIVE (Optoelectronics Effects):** Uniaxial crystal, optoelectronic effects, Electro-optic effect, Acousto-optic effect, Anisotropic crystal, Pockel cell, Kerr cell, phase modulation, amplitude modulation. Longitudinal & Transverse modes, Applications (6hrs).

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, expanding their thinking skills by discussions through classes, interactive tutorials and by build up demonstration OE prototypes.

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	67	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	4.466
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	3	20% (10)	2, 7 and 12	LO #3, #4 and #6, #7
	Report				
Summative assessment	**Midterm Exam**	2	20% (20)	7,13	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	CHAPTER ONE (Fundamentals of optoelectronics)
Week 2	CHAPTER ONE (Fundamentals of optoelectronics) Cont.
Week 3	CHAPTER ONE (Fundamentals of optoelectronics) Cont.
Week 4	CHAPTER TWO (Optoelectronics Devices)
Week 5	CHAPTER TWO (Optoelectronics Devices) Cont.
Week 6	CHAPTER TWO (Optoelectronics Devices) Cont.
Week 7	Midterm Exam 1
Week 8	CHAPTER THREE (Light Emitters).
Week 9	CHAPTER THREE (Light Emitters) Cont.
Week 10	CHAPTER FOUR (Detector)
Week 11	CHAPTER FOUR (Detector) Cont.
Week 12	CHAPTER FOUR (Detector) Cont.
Week 13	Midterm Exam 2

Week 14	CHAPTER FIVE (Optoelectronics Effects) Cont.
Week 15	CHAPTER FIVE (Optoelectronics Effects) Cont.

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	**Diode Lasers, by D. Sands, IOP Publishing Ltd, 2005.**	
Recommended Texts	• **Semiconductor Laser, by Weng W. chow,** 1999 . • **Semiconductor-Optoelectronic Devices, by Joachim Piprek, Academic Press, 2003.** • **Semiconductor Laser Fundamentals, by Toshiaki Suhara, Marcel Dekker ,Inc, 2004.** • **The Principles of Semiconductor Laser Diodes & amplifiers, by H Ghafouri-shiraz, Imperial College Press, 2004.**	
Websites		

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

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

MODULE DESCRIPTION FORM
نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	Digital Sequential Systems			**Module Delivery**	
Module Type	Core			☒ **Theory** ☐ **Lecture** ☒ **Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	LAER312				
ECTS Credits	7				
SWL (hr/sem)	175				
Module Level	3		**Semester of Delivery**	5	
Administering Department			**College**		
Module Leader	Ali Adnan Khalil		**e-mail**	ali.a.al-temeemy@nahrainuniv.edu.iq	
Module Leader's Acad. Title	Asst. Professor		**Module Leader's Qualification**	Ph.D.	
Module Tutor			**e-mail**		
Peer Reviewer Name			**e-mail**		
Scientific Committee Approval Date			**Version Number**		

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	LAER221	**Semester**	4
Co-requisites module		**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 sequential logic circuits. 2. To understand Asynchronous / Synchronous Counters operations, design, and their applications. 3. To understand Shift Registers functions, types, and their applications. 4. To understand digital signal processing and perform analog to digital and digital to analog conversions.

Module Learning Outcomes مخرجات التعلم للمادة الدراسية	This course tends to provide the student with fundamentals of sequential logic circuits. 1. Use logic gates to construct basic latches, explain the difference between an S-R latch and a D latch, and recognize the difference between a latch and a flip-flop. 2. Describe the difference between an asynchronous and a synchronous counter, analyze counter timing diagrams and counter circuits, and determine and modify the modulus of a counter. 3. Recognize the difference between a 4-bit binary, up/down, and a decade counter. 4. Design synchronous counter using Karnaugh Map. 5. Cascaded a counter and use logic gates to decode any given state of a counter. 6. Identify the basic forms of data movement in shift registers and explain how serial in/serial out, serial in/parallel out, parallel in serial out, parallel in/parallel, and bidirectional out shift registers operate. 7. Determine the sequence of a Johnson counter and ring counter to produce a specified sequence. 8. List the essential elements in a digital signal processing system and explain how analog signals are converted to digital form. 9. State the purpose of analog-to-digital conversion and explain how several types of ADCs operate. 10. State the purpose of digital-to-analog conversion and explain how DACs operate.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. <u>Introduction to Sequential Logic Circuit</u> Latches, Edge Triggered Flip-Flops, Master-Slave Flip Flops, Flip Flop Applications. [6 hrs] <u>Counters</u> Asynchronous Counters Operation, Synchronous Counters Operation, Up/Down (Bidirectional) Synchronous Counters, Cascaded Counters, Counter Decoding, Design of Synchronous Counters, Counter Applications. [12hrs] <u>Shift Registers</u> Basic Shift Register Functions, Serial In/Serial Out Shift Registers, Serial In/Parallel Out Shift Registers, Parallel In/Serial Out Shift Registers, Parallel In/Parallel Out Shift Registers, Bidirectional Shift Registers, Shift Register Counters, Shift Register Applications. [13 hrs] <u>Digital Signal Processing</u>

	Digital Signal Processing Basics, Converting Analog Signals to Digital, Analog to Digital Conversion Methods, Digital to Analog Conversion Methods. [12 hrs] Revision problem classes. [3 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	108	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	7
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	67	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	4.5
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**175**		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	5	10% (10)	Continuous	All
	Assignments	2	10% (10)	12 and 15	LO #6, #7 and #8, #10
	Projects / Lab.	5	10% (10)	Continuous	LO #1 - #7
	Report	5	10% (10)	Continuous	LO #1 - #7
Summative assessment	**Midterm Exam**	2hr	10% (10)	7	LO #1 - #5
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Introduction to Sequential Logic Circuit, Latches
Week 2	Edge Triggered Flip-Flops, Master-Slave Flip Flops, Flip Flop Applications.
Week 3	Asynchronous Counters Operation
Week 4	Synchronous Counters Operation
Week 5	Up/Down (Bidirectional) Synchronous Counters, Cascaded Counters
Week 6	Counter Decoding, Design of Synchronous Counters, Counter Applications
Week 7	Mid-term Exam + Basic Shift Register Functions
Week 8	Parallel In/Serial Out Shift Registers, Serial In/Serial Out Shift Registers
Week 9	Serial In/Parallel Out Shift Registers, Parallel In/Parallel Out Shift Registers
Week 10	Bidirectional Shift Registers
Week 11	Shift Register Counters, Shift Register Applications
Week 12	Digital Signal Processing Basics
Week 13	Converting Analog Signals to Digital
Week 14	Analog to Digital Conversion Methods
Week 15	Digital to Analog Conversion Methods
Week 16	**Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1-3	Lab 1: Sequential Logic Circuits
Week 4-6	Lab 2: The Asynchronous Counters
Week 7-9	Lab 3: The Synchronous Counters
Week 10-11	Lab 4: Decade Counters
Week 12-13	Lab 5: Shift Counters
Week 14-15	Lab 6: The Shift Registers

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Digital Fundamentals, by Thomas L. Floyd, Eighth Edition, 2003.	Yes
Recommended Texts	Digital Fundamentals, by Thomas L. Floyd, Eleventh Edition, 2014.	No
Websites		

Grading Scheme

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

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

MODULE DESCRIPTION FORM
نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Industrial Laser Applications**			**Module Delivery**	
Module Type	Core			☒ **Theory** ☐ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	LAER314				
ECTS Credits	7				
SWL (hr/sem)	175				
Module Level	3		**Semester of Delivery**	5	
Administering Department			**College**		
Module Leader	Dr. Fatema H. Rajab		**e-mail**	Fatema.h.rajab@nahrainuniv.edu.iq	
Module Leader's Acad. Title	Assist Prof.		**Module Leader's Qualification**	Ph.D	
Module Tutor	Name (if available)		**e-mail**	E-mail	
Peer Reviewer Name	Name		**e-mail**	E-mail	
Scientific Committee Approval Date	01/06/2023		**Version Number**	1.0	

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

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	This course tends to provide the student with basic types of industrial laser applications, their requirements and analysis.
Module Learning Outcomes	The Module Learning Outcomes of industrial laser applications typically include the following: 1. Understanding the basic principles and concepts of laser technology,

مخرجات التعلم للمادة الدراسية	including the characteristics of laser beams, laser types, and laser applications. 2. Familiarity with the different types of industrial lasers and their applications, such as laser marking, cutting, welding, and drilling. 3. Understanding the advantages and limitations of laser technology compared to traditional manufacturing techniques. 4. Knowledge of the safety measures and precautions required while working with industrial lasers. 5. Understanding the importance of proper maintenance and troubleshooting of industrial laser systems. 6. Ability to apply the knowledge and skills acquired in this module to real-world industrial laser applications. 7. Provide an understanding of the underlying physics of laser-material interactions, including laser-material ablation, laser annealing, ……and holography 8. provide an understanding of the difference between short and ultrashort lasers with their applications. 9. Understanding the potential of industrial laser applications in various industries and their impact on manufacturing processes and product design.
Indicative Contents المحتويات الإرشادية	• **Industrial Lasers and Their Applications:** Types of industrial lasers (high power, moderate power, low power lasers), characteristics of sample lasers, chart of industrial laser applications, introduction to laser material processing systems, Desired features of laser material processing, Basic elements of laser material processing systems, Types of beam delivery systems: moving workpiece, moving laser/moving mirror, moving mirrors, moving mirrors/moving workpiece, optical fiber, pictorial examples of beam delivery systems. (3hrs) • **Basic optics for laser material processing:** Lens arrangements, Mirrors arrangements, Beam expanders, Analysis of focusing characteristics for laser material processing (3hrs). • **Interaction of high-power laser radiation with solids:** Introduction, Absorption of laser radiation by solids and affecting factors, Heating phase (melting, evaporation, plasma formation), The chart of laser material processing and operational requirements (3 hrs) • **Heating of solids:** The basic theory of heat transfer in solids (Fourier law of heat conduction), Instantaneous source, Constant heat flux (point source analysis), Pulsed heat flux (point source analysis), Circular source, Estimation of melting, depth, Estimation of vaporization depth (6hrs). • **Laser surface treatment; techniques and analysis.** Features and advantages, process limitations, affecting factors, Types of laser surface treatment techniques (chart of requirements, transformation hardening, shock hardening, laser alloying, laser glazing, laser cladding, Semiconductor annealing (6 hrs). • **Laser beam welding:** Features and advantages, process limitations, affecting factors, Laser beam welding mechanisms (conduction welding and analysis, keyhole welding), Pictorial examples of laser welds, Assessment of laser beam weld quality (6hrs).

	• **Laser cutting:** Features and advantages, affecting factors, Laser cutting mechanisms (vaporization cutting, cutting by fusion and ejection, cutting by fusion in reactive gas, controlled fracture, scribing), Assessment of laser cut quality (6hrs). • **Laser Drilling:** Features and advantages, affecting factors, Laser drilling mechanisms (vaporization cutting, Assessment of laser cut quality) (3hrs) • **Holography:** (3hrs) • **Ultrashort Laser Applications** (3hrs) • **Additive Manufacturing** (3hrs)

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The course adopts a variety of learning and teaching strategies to enhance students' understanding and problem-solving skills. Some of the strategies include: - Lectures that introduce the main concepts and theories, supported by examples and demonstrations. - Tutorials that reinforce the lecture materials and allow students to practice solving problems in groups or individually. - Laboratory sessions that enable students to conduct experiments and observe the phenomena related to thermodynamics, heat transfer and static engineering. - Assignments that require students to apply their knowledge and skills to real-world scenarios and design problems. - Quizzes and exams that assess students' mastery of the course objectives and outcomes. The course also encourages students to use online resources and textbooks for self-study and revision. The instructor provides feedback and guidance throughout the course to help students achieve their learning goals.

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	6
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	82	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	5.5
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**175**		

Module Evaluation تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	3	10% (10)	Continuous	All
	Assignments	2	7% (10)	5 and 12	LO #1 - #9
	Projects / Lab.	5	16.5% (10)	Continuous	All
	Report	5	16.5% (10)	Continuous	All
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	Industrial Lasers and Their Applications
Week 2	Basic Optics for Laser Material Processing
Week 3	Interaction of High-power Laser Radiation with Solids
Week 4	Heating of Solids
Week 5	Heating of Solids cont.
Week 6	Laser Surface Treatment; Techniques and Analysis.
Week 7	Laser Surface Treatment; Techniques and Analysis cont.
Week 8	Laser Beam Welding.
Week 9	Midterm Exam + Laser Beam Welding Cont.
Week 10	Laser Cutting
Week 11	Laser Cutting Cont.
Week 12	Laser Drilling
Week 13	Holography
Week 14	Ultrashort Laser Applications
Week 15	Additive Manufacturing

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: Laser Safety
Week 2-3	Lab 2: Optics for Material Processing
Week 4-5	Lab 3: Laser Heating of Solid
Week 6-7	Lab 4: Measurement the absorption coefficient of materials
Week 8-9	Lab 5: Fiber Laser Processing of Materials

Week 10-12	Lab 6: CO2 Laser Processing of Materials
Week 13-14	Lab 7: Nanoparticles Generation and Applications

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts		
Recommended Texts	**1.** Lasers, principles and applications, J.Wilson & J.F.B. Hawkes, Prentice Hall 1987. **2.** Industrial applications of lasers, John F. Ready, Academic press 1978. **3.** CO_2 lasers, effects and applications, W.W. Duley, Academic press 1976. **4.** Lasers processing in manufacturing, R.C. Crafer & P.J. Oakley, Chapman & Hall 1993. **5.** Effects of high-power lasers radiation, John . F. Ready , Academic press 1971. **6.** Industrial applications of lasers, H.Koebner, John Wiley 1986. **7.** Laser material processing, W.M.Steen, 1999 **8.** Solid-State Lasers: A Graduate Text *Walter Koechner* &*Michael Bass* **9.** Principles of Laser Materials Processing *Elijah Kannatey-Asibu, Jr.*	
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

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MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Wave propagation**			**Module Delivery**	
Module Type	Core			☒ **Theory** ☐ **Lecture** ☐ **Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	LAER314				
ECTS Credits	3				
SWL (hr/sem)	75				
Module Level	3		**Semester of Delivery**	5	
Administering Department	Type Dept. Code		**College**	Type College Code	
Module Leader	Dr. Ahmad K. Ahmad		**e-mail**	ahmad.ahmad@nahrainuniv.edu.iq	
Module Leader's Acad. Title	Professor		**Module Leader's Qualification**	Ph.D.	
Module Tutor	Name (if available)		**e-mail**	E-mail	
Peer Reviewer Name	Name		**e-mail**	E-mail	
Scientific Committee Approval Date	01/06/2023		**Version Number**	1.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى

Prerequisite module	LAER211	**Semester**	4
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	Students should understand how Maxwell's equations lead to electromagnetic waves and what is the transmission lines and waveguides. Students should be able to solve simple problems involving electromagnetic waves in free space.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Understand the properties of antennas and their applications in communication systems. 2. Analyze the behavior of electromagnetic waves in transmission lines and waveguides. 3. Understand the basic principles of electromagnetic radiation and its interaction with matter, including absorption, scattering, and emission. 4. Analyze the behavior of electromagnetic waves in optical systems, including lenses, mirrors, and optical fibers. 5. Understand the properties of electromagnetic waves in the frequency domain, including Fourier transforms and spectral analysis. 6. Apply mathematical and computational tools to analyze and design electromagnetic systems and devices.
Indicative Contents المحتويات الإرشادية	**Plane Wave Reflection and Dispersion**: Reflection of Uniform Plane Waves at Normal Incidence, Standing Wave Ratio, Wave Reflection from Multiple Interfaces, Plane Wave Propagation in General Directions, Plane Wave Reflection at Oblique Incidence Angles, Total Reflection and Total Transmission of Obliquely Incident Waves, Wave Propagation in Dispersive Media, Pulse Broadening in Dispersive Media (8 hrs) **Transmission Lines:** Physical Description of Transmission Line Propagation, The Transmission Line Equations, Lossless Propagation, Lossless Propagation of Sinusoidal Voltages, Complex Analysis of, Sinusoidal Waves, Transmission Line Equations and Their Solutions in Phasor Form Low-Loss Propagation, Power Transmission and The Use of Decibels in Loss Characterization, Wave, Reflection at Discontinuities, Voltage Standing Wave Ratio, Transmission Lines of Finite Length, Some Transmission Line Examples, Graphical Methods: The Smith Chart (11hrs) **Guided Waves:** Transmission Line Fields and Primary Constants, Basic Waveguide Operation, Plane Wave Analysis of the Parallel-Plate Waveguide, Parallel-Plate Guide Analysis Using the Wave Equation, Rectangular Waveguides, Planar Dielectric Waveguides, Optical Fiber (11 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 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	48	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	3
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	27	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	1.8
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**75**		

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 #5, #6
	Assignments	2	10% (10)	2 and 12	LO #3, #4 and #7, #8
	Projects / Lab.	1	10% (10)	Continuous	All
	Report	1	10% (10)	13	LO #5, #8 and #10
Summative assessment	**Midterm Exam**	2hr	10% (10)	7,15	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	Magnetic Forces, Materials, and Inductance
Week 2	Magnetic Forces, Materials, and Inductance
Week 3	Magnetic Forces, Materials, and Inductance
Week 4	Time-Varying Fields and Maxwell’s Equations
Week 5	Time-Varying Fields and Maxwell’s Equations
Week 6	The Uniform Plane Wave
Week 7	Midterm Exam 1
Week 8	Plane Wave Reflection and Dispersion
Week 9	Plane Wave Reflection and Dispersion

Week 10	Transmission Lines
Week 11	Transmission Lines
Week 12	Transmission Lines
Week 13	Guided Waves
Week 14	Guided Waves
Week 15	Midterm Exam 2

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	**Engineering Electromagnetics 8th ed.** **William H. Hayt, Jr. and John A. Buck**	yes
Recommended Texts		
Websites		

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

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

MODULE DESCRIPTION FORM
نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Laser in Medicine**			**Module Delivery**	
Module Type	Core			☒ **Theory** ☐ **Lecture** ☐ **Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	LAER320				
ECTS Credits	4				
SWL (hr/sem)	100				
Module Level	3		**Semester of Delivery**	6	
Administering Department			**College**		
Module Leader	Ahmed Riedh Abass Al-Hamaoy		**e-mail**	Ahmed.al-hamaoy@nahrainuniv.edu.iq	
Module Leader's Acad. Title	Assist. Prof.		**Module Leader's Qualification**	Ph.D.	
Module Tutor	Name (if available)		**e-mail**	E-mail	
Peer Reviewer Name	Name		**e-mail**	E-mail	
Scientific Committee Approval Date	01/06/2023		**Version Number**	1.0	

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

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	This course tends to found a knowledge base for medical lasers and their applications via providing information about types of medical lasers, application tools, and common applications.
Module Learning Outcomes	The Module Learning Outcomes for Medical Laser Applications may vary depending on the level and scope of the course, but some common outcomes

مخرجات التعلم للمادة الدراسية	may include: 1. Understanding the basic principles of laser light and its interaction with biological tissues. 2. Identifying the different types of medical lasers and their applications in clinical settings. 3. Evaluating the risks and benefits of laser therapy in various medical conditions. 4. Developing skills in laser safety and proper handling of laser equipment. 5. Applying laser technology for diagnostic and therapeutic purposes in medicine. 6. Analyzing research studies and clinical trials on laser treatments. 7. Integrating laser therapy with other medical treatments and procedures. 8. Developing practical skills in using laser equipment for medical applications. 9. Collaborating with healthcare professionals in laser-based treatments. 10. Demonstrating ethical and professional behavior in laser therapy practice.
Indicative Contents المحتويات الإرشادية	• Introduction to Medical Laser Applications (4hrs) • Introduction to Anatomy (8hrs) • Laser Beam Delivery Arrangements for Medical Applications (4 hrs) • Laser Tissue Interaction (8 hrs) • Mathematical Analysis of Photothermal Effects (4 hrs) • Laser Therapy (4hrs) • Laser Applications in Dental industry (8 hrs) • Laser Application in Ophthalmology (8 hrs) • Laser Application in Dermatology (8 hrs) • Laser Application in Surgery (8 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	48	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	3
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	52	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	3.5
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**100**		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	2	10% (10)	5 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)	8,14	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 to Medical Laser Applications
Week 2	Introduction to Anatomy
Week 3	Laser Beam Delivery Arrangements for Medical Applications
Week 4	Laser Tissue Interaction
Week 5	Laser Tissue Interaction Cont.
Week 6	Mathematical Analysis of Photothermal Effects
Week 7	Laser Therapy
Week 8	Midterm exam 1
Week 9	Laser Applications in Dental Industry
Week 10	Laser Application in Ophthalmology
Week 11	Laser Application in Ophthalmology Cont.
Week 12	Laser Application in Dermatology
Week 13	Laser Application in Dermatology Cont.
Week 14	Midterm exam 2
Week 15	Laser Application in Surgery

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**

Required Texts	1. "Medical Applications of Laser" by Haim Baruch 2. "Laser Applications in Medicine and Biology" by M. L. Wolbarsht 3. "Lasers in Medicine" by Reginald Birngruber and Johannes F. Bille 4. "Medical Laser Applications and Laser-Tissue Interactions" by Karl Stock and Raimund Hibst 5. "Laser-Tissue Interactions: Fundamentals and Applications" by Markolf H. Niemz 6. "Laser Applications in Surgery and Medicine" by Ronald S. Katz 7. "Laser Dermatology: Pearls and Problems" by David J. Goldberg, Jeffrey S. Dover, and Murad Alam 8. "Laser Therapy in Veterinary Medicine: Photobiomodulation" by Ronald J. Riegel and John C. Godbold Jr. 9. "Laser Applications in Ophthalmology" by Michael Belkin and Mordechai Rosner 10. "Lasers in Cardiovascular Medicine and Surgery: Fundamentals and Techniques" by Mark J. Monaghan and Michael R. Treat.	
Recommended Texts		
Websites		

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

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

MODULE DESCRIPTION FORM
نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Spectroscopy**			**Module Delivery**	
Module Type	Core			☒ **Theory** ☐ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	LAER321				
ECTS Credits	4				
SWL (hr/sem)	100				
Module Level	3		**Semester of Delivery**	6	
Administering Department	Type Dept. Code		**College**	Type College Code	
Module Leader	Tagreed. K. Hamad		**e-mail**	Tagreed.k.hamad@nahrinuniv.edu.iq	
Module Leader's Acad. Title	Assist Prof.		**Module Leader's Qualification**	Ph.D.	
Module Tutor	Name (if available)		**e-mail**	E-mail	
Peer Reviewer Name	Name		**e-mail**	E-mail	
Scientific Committee Approval Date	01/06/2023		**Version Number**	1.0	

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

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	**The first purpose is to give students fundamentals of Electromagnetic spectrum, while the second is to teach them about the H-atom, Spin Interaction, and Molecular Interaction.**
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	The Module Learning Outcome of the spectroscopy course includes understanding the principles and techniques of spectroscopy, interpreting spectroscopic data, and applying spectroscopic methods in various fields such as chemistry, physics, and biology.

Indicative Contents المحتويات الإرشادية	• Hydrogen Atom and Spectrum of Hydrogen Atom. (2hrs) • Zeeman effects and Splitting of S-P-D Levels under the Action of Magnetic field. (2hrs) • Electron Spin and Electronic Structure of atoms. (2hrs) • Addition of Angular Momentum(2hrs) • Spin Orbit Interaction(2hrs) • Atoms with Many Electrons(2hrs) • The Helium (He) Atom(2hrs) • LS-Coupling and Hand Rule. (2hrs) • Radiation Transitions. (2hrs) • Spin orbit coupling for many electrons atom. (2hrs) • J-J Coupling for atom. (2hrs) • Magnetic Interaction. (2hrs) • Molecular Spectra and Molecular Energy levels. (2hrs) • Microwave spectroscopy. (2hrs) • Infrared Spectroscopy (IR). (2hrs)

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	63	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	37	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	2.5
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**100**		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	2	10% (10)	5 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)	16,13	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	Hydrogen Atom and Spectrum of Hydrogen Atom.
Week 2	Zeeman effects and Splitting of S-P-D Levels under the Action of Magnetic field.
Week 3	Electron Spin and Electronic Structure of atoms.
Week 4	Addition of Angular Momentum
Week 5	Spin Orbit Interaction, Atoms with Many Electrons
Week 6	Midterm Exam 1
Week 7	The Helium (He) Atom
Week 8	LS-Coupling and Hand Rule.
Week 9	Radiation Transitions.
Week 10	Spin orbit coupling for many electrons atom.
Week 11	J-J Coupling for atom.
Week 12	Magnetic Interaction, Molecular Spectra and Molecular Energy levels.
Week 13	Midterm Exam 2
Week 14	Microwave spectroscopy.
Week 15	Infrared Spectroscopy (IR).

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Spectrophotometer: part one: operation principle and the relation between the absorption and concentration
Week 2	Spectrophotometer: part two: relation between absorption, transmission, and refractive index
Week 3	Spectrophotometer: part three: calculation of linear absorption coefficient and bandgap
Week 4	Spectrofluorometer: part one: operation principle
Week 5	Spectrofluorometer: part two: quantum efficiency
Week 6	Spectrofluorometer: part three: fluorescence lifetime and radiative lifetime

Week 7	Infrared spectroscopy

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts		
Recommended Texts		
Websites		

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

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

MODULE DESCRIPTION FORM
نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	Optical systems design			**Module Delivery**	
Module Type	Core			☒ **Theory** ☐ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	LAER322				
ECTS Credits	5				
SWL (hr/sem)	125				
Module Level	3		**Semester of Delivery**	6	
Administering Department	Type Dept. Code		**College**	Type College Code	
Module Leader	Alhuda A. Almfrji		**e-mail**	Alhuda.a.oied@nahrainuniv.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	LAER 121	**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	**To identify most of the elements and systems that transfer or focus the laser beam to the target correctly, for instance, the different types of lenses , simple or complex, e.g. singlet, doublet and different triplet lenses, in addition to the combination formulas, NA, telescopes, system performance.**
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Understand the basic principles of optics and the properties of light. 2. Analyze and design optical components such as lenses, mirrors, prisms, and filters. 3. Understand the concept of aberrations and their effect on image formation. 4. Choose appropriate optical materials and coatings for specific applications.

	5. Use software tools to simulate and optimize optical systems. 6. Design and analyze imaging systems, including cameras and microscopes. 7. Understand the design of optical instruments for spectroscopy and metrology. 8. Have a comprehensive understanding of illumination systems and light sources. 9. Design optical systems for a variety of applications such as telecommunications, medical imaging, and remote sensing. 10. Understand the importance of fabrication and alignment of optical components for system performance.
Indicative Contents المحتويات الإرشادية	**Gaussian Optics: The Cardinal Points** Introduction , Cardinal Points of an Optical System , Image Position and Size , A Collection of Imagery Equations , Optical Systems Not Immersed in Air (2hrs) **Paraxial Optics and Calculations** Refraction of a Light Ray at a Single Surface , The Paraxial Region , Paraxial Raytracing through Several Surfaces , Calculation of the Focal Points and Principal Points , The "Thin Lens" and Mirrors (2hrs) **Optical System Considerations** Systems of Separated Components , The Optical Invariant Matrix Optics , The y-ybar Diagram , The Scheimpflug , Summary of Sign Conventions (4hrs) **The Primary Aberrations ,** Introduction , The Aberration Polynomial and the Seidel Aberrations , Chromatic Aberrations , The Effect of Lens Shape and Stop Position on the Aberrations , Aberration Variation with Aperture and Field , Optical Path Difference (Wave Front Aberration) , Aberration Correction and Residuals , The Relationships between Longitudinal Aberration, , Transverse Aberration, Wave-Front Aberration (OPD), and Angular Aberration (4hrs) **Optical System Layout,** Telescopes, Afocal Systems , Field Lenses and Relay Systems , Exit Pupils, the Eye, and Resolution , The Simple Microscope or Magnifier , The Compound, Microscope , Rangefinders , Radiometer and Detector Optics , Variable-Power (Zoom) Systems , The Diffractive Surface(4hrs) **Third-Order Aberration Theory and Calculation,** Introduction, Paraxial Raytracing , Third-Order Aberrations: Surface Contributions , Third-Order, Aberrations: Thin Lenses; Stop Shift Equations , Sample Calculations (4hrs) **Characteristics of the Human Eye** Introduction , The Structure of the Eye , Characteristics of the Eye, Defects of the Eye (2hrs) **Stops, Apertures, Pupils and Diffraction** Introduction , The Aperture Stop and Pupils , The Field Stop , Glare Stops, Cold Stops, Baffles and Telecentric Stop , Apertures and Image Illumination—*f*-Number and Cosine-Fourth , Diffraction Effects of Apertures , Resolution of Optical Systems , Diffraction of a Gaussian (Laser) Beam , The Fourier Transform Lens and Spatial Filtering (4hrs) **Polarization Issues in Optical Design** Introduction to Polarization , The Mathematical, Description of Polarized Light , Some Polarization Phenomena , Polarization Control Nuts and Bolts , Polarization Analysis of an Optical System , Minimizing Polarization Problems in Optical Design , Polarization as a Tool in Optical System Design (4hrs)

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	63	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	62	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	4.133
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% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Gaussian Optics: The Cardinal Points
Week 2	Paraxial Optics and Calculations
Week 3	Optical System Considerations
Week 4	Optical System Considerations cont.
Week 5	The Primary Aberrations
Week 6	The Primary Aberrations cont.
Week 7	Midterm Exam
Week 8	Optical System Layout.
Week 9	Third-Order Aberration Theory and Calculation
Week 10	Third-Order Aberration Theory and Calculation cont.
Week 11	Characteristics of the Human Eye
Week 12	Stops, Apertures, Pupils and Diffraction

Week 13	Stops, Apertures, Pupils and Diffraction cont.
Week 14	Polarization Issues in Optical Design
Week 15	Polarization Issues in Optical Design cont.

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: Introduction to optical modeling in COMSOL Multiphysics
Week 2	Lab 2: Setup a multi-element objective lens (Double Gauss lens)
Week 3	Lab 3: Understanding the paraxial Gaussian beam formula
Week 4	Lab 4: Optical Aberration plot and aberration evaluation
Week 5	Lab 5: Design of Newtonian Telescope
Week 6	Lab 6: Simulate Ray Tracing in optically large system
Week 7	Lab 7: How to create complex lens geometries for ray optics simulation
Week 8	Lab 8: Geometrical optics with COMSOL Multiphysics ray tracing –Thin lens – Lens markers formula
Week 9	Lab 9: Plasmonic meniscus lens
Week 10	Lab 10: Design of multilayer physical model of human eye based on physiological dynamic parameter
Week 11	Lab 11: 3D optical human eye model based on COMSOL to provide a Test bench for laser surgery.

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	1- OPTICAL SYSTEM DESIGN, 2nd Ed. , McGraw Hill, 2008 Robert E. Fischer, Biljana Tadic-Galeb and Paul R. Yode 2- Modern Optical Engineering, The Design of Optical Systems, 4th Ed. Warren J. Smith, McGraw Hill, 2008 3- Aberrations of Optical Systems, W T Welford FRS, Adam Hilger, 1986	
Recommended Texts	•	
Websites		

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks %**	**Definition**

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

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

MODULE DESCRIPTION FORM
نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	Communications Theory and Networks			**Module Delivery**	
Module Type	Core			☒ **Theory** ☐ **Lecture** ☐ **Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	LAER323				
ECTS Credits	7				
SWL (hr/sem)	175				
Module Level	3		**Semester of Delivery**	6	
Administering Department	Type Dept. Code		**College**	Type College Code	
Module Leader	Rasha Khalid Mohammed Al-Dabbagh		**e-mail**	r.k.al_dabbagh@nahrainuniv.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. Understanding the fundamental principles of communication theory and networking technologies. 2. Exploring the different types of communication networks, including wired and wireless networks. 3. Understanding the different layers of the OSI model and how they impact communication protocols. 4. Analyzing network congestion and ways to control it.

	5. Understanding the principles of data compression and encryption. 6. Understanding routing algorithms and other methods of data transmission in networks. 7. Understanding the principles of network security and ways to protect against attacks. 8. Developing skills in designing and implementing communication networks. 9. Understanding the role of network protocols in enabling different devices to communicate with each other. 10. Preparing students for careers in communication technology and networking fields.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Understand the fundamental concepts and principles of communication theory and network protocols. 2. Describe the key components of communication, including sources, transmitters, channels, receivers, and noise. 3. Grasp the basics of various modulation techniques used in communication systems. 4. Analyze and design communication systems using appropriate mathematical models and tools. 5. Comprehend the principles and functions of different types of networks, including local area networks (LANs), wide area networks (WANs), and wireless networks. 6. Evaluate network performance measures and parameters, such as bandwidth, latency, and throughput. 7. Understand the basics of network protocols and their role in data transmission and networking. 8. Gain practical skills in configuring, troubleshooting, and managing computer networks. 9. Analyze the impact of network design choices on performance, security, and scalability. 10. Recognize and address ethical and legal issues related to communication systems and networks.
Indicative Contents المحتويات الإرشادية	Historical review 15m Network topology 20-25m OSI (Open System Interconnections Model) 45m _____ Network component 35m Connection type 30m _____ IP Address (Internet Protocol) and MAC Address (Media Access Control) 30m Subnetting 40m

	IPv4 and IPv6 10m _____ ARP (Address Resolution Protocol) 30m Private and Public IP with NAT (Network Address Translation) 15m Gateway 15m _____ VLAN (Virtual Local Area Network) 45m interface and cable issues (collisions, errors, duplex, speed) 20m Port Channel 20m _____ Static Route 30m Interface VLAN 10m Dynamic Route 15m DHCP (Dynamic Host Configuration Protocol 10m

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	6
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	82	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	5.5
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**175**		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	2	10% (10)	5 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)	7,14	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	Communication systems, analog and digital messages, signal bandwidth and power channel capacity and data rate | Network fundamental
Week 2	Size of a signal, classification of signals, continuous time and discrete time signals , analog and digital signals , periodic and aperiodic signals , energy and power signals | Network component
Week 3	Unit impulse signal, correlation of signals , correlation function | Ip and Mac addressing
Week 4	The exponential Fourier series | Network Lecture 3
Week 5	Analysis and transmission of signals , transforms of some useful functions , some properties of the Fourier transform , time-frequency duality, duality property time-scaling property, time-shifting property, frequency-shifting property . | Subnetting
Week 6	Analysis and transmission of signals , transforms of some useful functions , some properties of the Fourier transform , time-frequency duality, duality property time-scaling property, time-shifting property, frequency-shifting property . | ARP (Address Resolution Protocol)
Week 7	Exam 1
Week 8	Signal distortion over a communication channel, linear distortion , distortion caused by channel nonlinearities | VLAN (Virtual Local Area Network)
Week 9	Amplitude modulations and demodulations , baseband versus carrier communications, double-sideband amplitude modulation | interface and cable issues (collisions, errors, duplex, speed) and Port Channel
Week 10	Amplitude modulations and demodulations , baseband versus carrier communications, double-sideband amplitude modulation |
Week 11	Angle modulation and demodulation, nonlinear modulation , bandwidth of angle-modulated waves ,generating FM waves ,demodulation of FM signals | Static Route and Interface Vlan
Week 12	Angle modulation and demodulation, nonlinear modulation , bandwidth of angle-modulated waves ,generating FM waves ,demodulation of FM signals | Dynamic route and DHCP
Week 13	Behavior of analog systems in the presence of noise, baseband systems, amplitude modulated systems, angle modulated systems. | Network Lab

Week 14	Exam 2
Week 15	Behavior of analog systems in the presence of noise, baseband systems, amplitude modulated systems, angle modulated systems. | Network Lab
Week 16	**Preparatory week before the final Exam**

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

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts		Yes
Recommended Texts		No
Websites		

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

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

MODULE DESCRIPTION FORM
نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Computer Architecture**			**Module Delivery**	
Module Type	Core			☒ **Theory** ☐ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	LAER324				
ECTS Credits	7				
SWL (hr/sem)	175				
Module Level	3		**Semester of Delivery**	6	
Administering Department	Type Dept. Code		**College**	Type College Code	
Module Leader	Dr. Anwaar A Al Dergazly		**e-mail**	anwar.a.al_dergazly@nahrainuniv.edu.iq	
Module Leader's Acad. Title	Assist Prof.		**Module Leader's Qualification**	Ph.D.	
Module Tutor	Name (if available)		**e-mail**	E-mail	
Peer Reviewer Name	Name		**e-mail**	E-mail	
Scientific Committee Approval Date	01/06/2023		**Version Number**	1.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module		**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	This course aims to give the students a fundamental overview about the computer internal architecture, with concentrating on the Microprocessor architecture and its instruction sets. Also This course tends to provide the student with fundamentals of input/output interface circuits. a computer architecture module can provide students with a solid foundation in the principles that underlie modern computing systems.

Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Understand the basics of CPU processing and how different design choices impact performance and power efficiency. 2. Analyze and optimize instruction sets for different processor architectures (e.g. x86, ARM, RISC-V) and applications. 3. Describe different memory hierarchies and their trade-offs, and understand how memory access times can impact overall system performance. 4. Compare and contrast different parallel processing techniques, such as SIMD, MIMD, and multithreading. 5. Create and analyze simple assembly language programs, and explain how higher-level programming languages (such as C) interact with machine code. 6. Understand the basic principles of cache design, including cache coherence protocols and their relationship to shared memory architectures. 7. Identify and discuss key trends in computer architecture design, including emerging technologies such as quantum computing, neuromorphic processing, and more.
Indicative Contents المحتويات الإرشادية	• Syllabus presentation, Introduction to µprocessors and µcomputers, and General Architecture of µcomputer (2 hrs) • Data Types, Segment Register and Memory Segmentation, and Instruction Pointer (2 hrs). • Data Registers, Pointer and Index Registers, and Status Register. (2 hrs) • Generating Memory Address, The Stack, and Input/ Output Address Space (2 hrs) • Register Operand Addressing Mode, Immediate Operand Addressing Mode (2 hrs), • Memory Operand Addressing Modes (2 hrs). • Flag Control Instructions, Compare Instructions, Control Flow Instructions, (Subroutine, Loops, and String Instructions) (2 hrs). • Memory Interface Circuits, (Types of Input/Output, their Instructions and Bus Cycle), Isolated Input/ Output Interface and Data Transfers (2 hrs). • Review to I/O Interfaces (2 hrs). • Hardware Specifications, Pin Out, Minimum and Maximum Modes, and the System Clock(2 hrs) • Types of I/O, their Instructions and Bus Cycle, Isolated I/O Interface and Data Transfers. (2 hrs) • Output/Input Ports using Isolated I/O, and I/O Handshaking and Parallel Printer Interface. (2 hrs) • Interrupt Instructions, and Enabling / Disabling of Interrupts. (2 hrs) • External Hardware-Interrupt Interface Signal, and External Hardware-Interrupt Sequence. (2 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	123	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	8
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	52	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	3.466
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**175**		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	2	10% (10)	5 and 10	LO #1, #2 and #10, #11
	Assignments	2	10% (10)	2 and 12	LO #3, #4 and #6, #7
	Projects / Lab.	5	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	Syllabus presentation, Introduction to µprocessors and µcomputers, and General Architecture of µcomputer
Week 2	Data Types, Segment Register and Memory Segmentation, and Instruction Pointer.
Week 3	Data Registers, Pointer and Index Registers, and Status Register.

Week 4	Generating Memory Address, The Stack, and Input/ Output Address Space
Week 5	Register Operand Addressing Mode, Immediate Operand Addressing Mode,
Week 6	Memory Operand Addressing Modes.
Week 7	Midterm Exam
Week 8	Flag Control Instructions, Compare Instructions, Control Flow Instructions, (Subroutine, Loops, and String Instructions).
Week 9	Memory Interface Circuits, (Types of Input/Output, their Instructions and Bus Cycle), Isolated Input/ Output Interface and Data Transfers.
Week 10	Review to I/O Interfaces.
Week 11	Hardware Specifications, Pin Out, Minimum and Maximum Modes, and the System Clock
Week 12	Types of I/O, their Instructions and Bus Cycle, Isolated I/O Interface and Data Transfers.
Week 13	Output/Input Ports using Isolated I/O, and I/O Handshaking and Parallel Printer Interface.
Week 14	Interrupt Instructions, and Enabling / Disabling of Interrupts.
Week 15	External Hardware-Interrupt Interface Signal, and External Hardware-Interrupt Sequence.

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: Introduction to Arduino
Week 2	Lab 2: Digital input in Arduino with (if, else, switch) statement
Week 3	Lab 3: Analogue input in Arduino with (PMM, Mapping variables)
Week 4	Lab 4: sensors and servo motor with Arduino libraries
Week 5	Lab 5: Synchronous and Asynchronous serial with Arduino serial functions

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts		
Recommended Texts		
Websites		

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks %**	**Definition**
Success Group (50 - 100)	**A -** Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors

	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX –** Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

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

MODULE DESCRIPTION FORM
نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	Statistics and Probability			**Module Delivery**	
Module Type	Basic			☒ **Theory** ☐ **Lecture** ☐**Lab** ☐**Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	CERSTA				
ECTS Credits	3				
SWL (hr/sem)	75				
Module Level		3	**Semester of Delivery**		6
Administering Department		LASER	**College**	Engineering	
Module Leader	Wurood A. Khaleel		**e-mail**	Wurood.a.khaleel@nahrainuniv.edu.iq	
Module Leader's Acad. Title		Asst. Professor	**Module Leader's Qualification**		Ph.D.
Module Tutor	Wurood A. Khaleel		**e-mail**	Wurood.a.khaleel@nahrainuniv.edu.iq	
Peer Reviewer Name			**e-mail**		
Scientific Committee Approval Date			**Version Number**		

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

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	1. To use graphical and descriptive statistics to summarize and display engineering problem information. 2. To employ inferential statistics to solve engineering problems.

	3. To plan and conduct fundamental experiments of design, analyze the results, and make recommendations based on the analysis. 4. Know and apply the basic probability rules, the concepts of expected value and variance for discrete and continuous variables.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	After participating in the course, students would be able to: 1. Understand basic statistics, sampling distributions, and data analysis. 2. Apply statistical concepts such as means, variances, and various types of graphs 3. Apply basic mathematical concepts in probability. 4. Use common discrete and continuous probability functions. 5. Understand the fundamental sampling distributions, data descriptions, linear regression, and hypothesis testing.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. <u>The Nature of Probability and Statistics</u> Demonstrate knowledge of statistical terms. Differentiate between the two branches of statistics. Identify types of data. Identify the measurement level for each variable. Identify the four basic sampling techniques. Explain the difference between an observational and an experimental study. [8 hrs] <u>Frequency Distributions and Graphs</u> Organize data using a frequency distribution. Represent data in frequency distributions graphically using histograms, frequency polygons, and ogives. Represent data using bar graphs, and pie graphs. Draw and interpret a stem and leaf plot. [12 hrs] <u>Data Description</u> Summarize data, using measures of central tendency, such as the mean, median, mode, and midrange. Describe data, using measures of variation, such as the range, variance, and standard deviation. Identify the position of a data value in a data set, using various measures of position, such as percentiles, deciles, and quartiles. [13 hrs] <u>Probability and Counting Rules</u> Determine sample spaces and find the probability of an event, using classical probability or empirical probability. Find the probability of compound events, using the addition rules. Find the probability of compound events, using the multiplication rules. Find the conditional probability of an event. Find the total number of outcomes in a sequence of events, using the fundamental counting rule. Find the number of ways that r objects can be selected from n objects, using the permutation rule. [30 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 projrcts or seminar 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	48	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	3
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	27	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	1.8
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**75**		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	3	10% (10)	Continuous	All
	Assignments	3	10% (10)	12 and 15	LO #8, #10 and #11, #13
	Projects / Lab.	1	10% (10)	Continuous	LO #1 - #10
	classwork	3	10% (10)	Continuous	LO #1 - #10
Summative assessment	**Midterm Exam**	2hr	10% (10)	8	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 to the concepts of statistics
Week 2	Organize data using a frequency distribution.
Week 3	Histograms, Frequency Polygons, and Ogives
Week 4	Measures of Central Tendency: Mean
Week 5	Measures of Central Tendency: median, mode and other measuring of Tendency
Week 6	Tutorial
Week 7	Identify the position of a data value in a data set, using various measures of position, such as percentiles, deciles, and quartiles.
Week 8	Mid-term Exam
Week 9	Measures of Variation: mean deviation, standard deviation, variance and range
Week 10	Measures of position: standard score
Week 11	Classical definition of probability
Week 12	The Addition Rules for Probability
Week 13	The Multiplication Rules and Conditional Probability
Week 14	Probability and Counting Rules
Week 15	Examples
Week 16	**Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1-3	
Week 4-6	
Week 7-9	
Week 10-11	
Week 12-13	
Week 14-15	

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Elementary statistics step by step approach, Allan G. Bluman, 7th edition, 2009	NO
Recommended Texts	Schaum's outlines, theory and problem of statistics, 4th edition, 2008	YES
Websites		

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

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

MODULE DESCRIPTION FORM
نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية			
Module Title	Professional Ethics	**Module Delivery**	
Module Type	Basic	☒ **Theory** ☐ **Lecture** ☐ **Lab** ☐ **Tutoral** ☐ **Practical** **Seminar**	
Module Code	URPET		
ECTS Credits	1		
SWL (hr/sem)	25		
Module Level	4	**Semester of Delivery**	8
Administering Department		**College**	003
Module Leader	Lecturer: Fatma Dheif Ali	**e-mail**	Fatma.d.ali@nahrainuniv.edu.iq
Module Leader's Acad. Title	Lecturer	**Module Leader's Qualification**	M.SC
Module Tutor		**e-mail**	
Peer Reviewer Name		**e-mail**	
Scientific Committee Approval Date	17/6/2023	**Version Number**	1.0

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

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	Studying the subject of professional ethics, its importance, components and factors affecting it. View professional and engineering codes. Identify disasters that cause lack of professional ethics. Identify the ethics of scientific research. Quotation and induction. Writing technical reports, projects and graduation project.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1: Enabling the student to know the main principles of the most prominent ethics of the engineering profession, its sources and types, and the mechanisms used for its purpose.

	2: Enabling the student to know all the basics that he uses in the scientific subject 3: The soft skills objectives of the course. The students were able to acquire the basic information necessary to liberate it from all violations, to know the most important ethics, and to instill a sense of responsibility towards their individual rights and public interests.4: To learn to use standard practices and standard data. 4: Familiarizing students with the ethics of scientific research, the mechanism of writing reports and projects, and scientific honesty, and introducing them to the citation mechanism and the seriousness of scientific plagiarism.
Indicative Contents المحتويات الإرشادية	Introduction. The concept of professional ethics. general concept. Linguistic concept. terminological concept. The importance of professional ethics in life. The importance of the client in life. The important elements of professional ethics. Conscience, interest, regulations and systems, work organization, work contract, work control.(9) Ethics related to professional ethics, honesty at work, honesty, advice, justice, forgiveness, humility, forbearance, patience(3) Engineering ethics: introduction, engineering practice, blog history, engineering disasters(6) Examples of Codes of Engineering Ethics: Code of Hammurabi, Code of ABBT National Society of Professional Engineers Code of Ethics for engineers, IEEE Code of Ethics (6) Writing research and reports, graduation project clerks, introduction, body, conclusions, conclusion, reference to sources, table of contents.(6)

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

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	18	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	1
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	7	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	0.5
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	25		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	4	15% (15)	3,5,7, 10	All
	Assignments	4	15% (15)	2,4,8,15	All
	Projects / Lab.	-	-	-	-
	Report	1	10% (10)	12	All
Summative assessment	**Midterm Exams**	2hr	10% (10)	8,13	All
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Introduction. The concept of professional ethics. general concept. Linguistic concept.
Week 2	Terminological concept. The importance of professional ethics in life.
Week 3	The importance of the client in life. The important elements of professional ethics. Conscience, interest, regulations and systems, work organization, work contract, work control.
Week 4	Ethics related to professional ethics.
Week 5	Honesty at work, honesty, advice, justice.
Week 6	Forgiveness, humility, forbearance, patience.
Week 7	Engineering ethics: introduction, engineering practice.
Week 8	Blog history
Week 9	Codes and Profession Codes of Athics, Code of ABBT.
Week 10	engineering disasters
Week 11	Teaching engineering ethics
Week 12	Examples of Codes of Engineering Ethics: Code of Hammurabi
Week 13	National Society of Professional Engineers Code of Ethics for engineers
Week 14	IEEE Code of Ethics
Week 15	Seminar
Week 16	**Preparatory week before the final Exam**

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

Week 3	
Week 4	
Week 5	
Week 6	
Week 7	

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	قواعد واخلاقيات ممارة مهنة الهندسية (دنبيل عبد الرزاق جاسم)	Yes
Recommended Texts	Bowen, W. Richard, "*Engineering Ethics*", UK Springer, 2009.	No
Websites	https://youtu.be/LAjsTHUP2ZI	

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

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

MODULE DESCRIPTION FORM
نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Laser Detection Systems**			**Module Delivery**	
Module Type	Core			☒ **Theory** ☐ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	LAER410				
ECTS Credits	7				
SWL (hr/sem)	175				
Module Level	4		**Semester of Delivery**	7	
Administering Department			**College**		
Module Leader	Dr. Anwaar A Al Dergazly		**e-mail**	anwar.a.al_dergazly@nahrainuniv.edu.iq	
Module Leader's Acad. Title	Assist Prof.		**Module Leader's Qualification**	Ph.D.	
Module Tutor	Name (if available)		**e-mail**	E-mail	
Peer Reviewer Name	Name		**e-mail**	E-mail	
Scientific Committee Approval Date	01/06/2023		**Version Number**	1.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	LAER120	**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	To identify most of the elements and systems that transfer or focus the laser beam to the target correctly, for instance, the different types of lenses, simple or complex, e.g. singlet, doublet and different triplet lenses, in addition to the combination formulas, NA, telescopes, system performance.
Module Learning Outcomes	The module learning outcomes of laser detection systems may include the ability to:

مخرجات التعلم للمادة الدراسية	1. Understand the basic principles and properties of laser beams and their interaction with matter. 2. Identify the different types of laser detectors and their main applications. 3. Interpret the specifications of a laser detector, including its sensitivity, response time, and noise characteristics. 4. Analyze the performance of a laser detection system using various metrics, such as the signal-to-noise ratio, detection probability, and false alarm rate. 5. Apply different techniques for enhancing the performance of a laser detection system, such as background subtraction, noise filtering, and thresholding. 6. Design and optimize a laser detection system for a given application, taking into account the specific requirements and constraints. 7. Evaluate the performance of a laser detection system through experimentation and analysis of the collected data. 8. Communicate effectively about laser detection systems to both technical and non-technical audiences.
Indicative Contents المحتويات الإرشادية	• Radiation theory (2hrs). • Type of detections (2hs). • Photoemission detectors (2hrs). • Type of Photoemission detectors (2hrs). • Photoconduction detectors (2hrs). • Type of Photoconduction detectors (2hrs). • Photo diode detectors (2hrs). • Thermal detector (2hrs) • Photo-acoustic detector (2hrs). • IR system (4hrs). • Thermal camera. Range detection (2hrs). • Thermal detection (4hrs). • Noise measurement (2hrs).

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	78	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	5
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	97	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	6.5
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**175**		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	2	10% (10)	5 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	Radiation Theory.
Week 2	Type of Detections.
Week 3	Photoemission Detectors.
Week 4	Type of Photoemission Detectors.
Week 5	Photoconduction Detectors.
Week 6	Type of Photoconduction Detectors.
Week 7	Midterm Exam
Week 8	Photo Diode Detectors.
Week 9	Thermal Detector
Week 10	Photo-Acoustic Detector.
Week 11	IR System.
Week 12	Thermal Camera. Range Detection.
Week 13	Thermal Detection.
Week 14	Thermal Detection Cont.

Week 15	Noise Measurement

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: Determine Detectors Figure of merit
Week 2	Lab 2: characteristic of solar cell
Week 3	Lab 3: characteristic of photo diode
Week 4	Lab 4: characteristic of photo transistor
Week 5	Lab 5: photomultiplier tube

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	**Modern Optical Engineering ,The Design of Optical Systems , by Warren J. Smith, 3rd ed, McGraw-Hill, 2000.**	
Recommended Texts	• **Optical Sources, Detectors and Systems , Fundamentals and Applications, by Robert H. Kingston, Academic Press, 1995.** • **Introduction to Optics, by Frank L. Pedrotti & Leno S. Pedrotti , Prentice- Hall , 2nd ed, 1993.** • **The Laser guidebook , McGraw-Hill , 2004.** • **Handbook of Optics , Techniques and Design, Vol. I , Edited by Michael bass, McGraw-Hill, 1995.** • **Modern optical engineering, The design of Optical systems, by Warren J. Smith, McGraw-Hill , 2000.**	
Websites		

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

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

MODULE DESCRIPTION FORM
نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	Control Theory			**Module Delivery**	
Module Type	Core			☒ **Theory** ☐ **Lecture** ☐ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	LAER411				
ECTS Credits	7				
SWL (hr/sem)	175				
Module Level	4		**Semester of Delivery**	7	
Administering Department	Type Dept. Code		**College**	Type College Code	
Module Leader	Alaa siham hamid		**e-mail**	Alqadia43@gmail.com	
Module Leader's Acad. Title	Assist lecture		**Module Leader's Qualification**	MS.C	
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	LAER 210, 220	**Semester**	2,4
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 control theory through the application of techniques. 2. To understand set point, controller, system, feedback and output variable from a given block diagram. 3. This course deals with the basic concept of control theory. 4. This is the basic subject for all control and control theory. 5. To understand amplitude and phase to different frequency. 6. To understand open loop system and closed loop system.

	7. To understand linear differential equation, laplace transform and transfer function.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Recognize how control works in control theory. 2. List the various terms associated with control theory. 3. Summarize what is meant by a basic control theory. 4. Discuss the system stability analysis. 5. Describe set point, controller, system, feedback and output variable. 6. Identify the basic control elements and their applications.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. <u>Control Theory</u> Introduction: Definition of automatic control system, Mathematical representation of control components, Control system (Electronic and Mechanical systems), Transfer function representation Definition, poles and zeros. [15 hrs] Stability definitions, Routh stability criterion, Block diagram representation, Definition, Block diagram reduction. [15 hrs] Signal flow graphs, Control system classification Definition of order, Type and steady state error constants. [10 hrs] Transient response analysis, First impulse and step responses, Second order impulse and step responses, Stability, Lead and lag compensators design. [15 hrs] Revision problem classes [6 hrs]

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The main strategy that will be adopted in delivering this module is to encourage students' participation 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)	78	**Structured SWL (h/w)**	5

الحمل الدراسي المنتظم للطالب خلال الفصل		الحمل الدراسي المنتظم للطالب أسبوعيا	
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	97	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	4.5
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**175**		

Module Evaluation
تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	2	10% (10)	5 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	Introduction: Definition of automatic control system.
Week 2	Mathematical representation of control components
Week 3	Control system (Electronic and Mechanical systems).
Week 4	Transfer function representation Definition, poles and zeros.
Week 5	Stability definitions.
Week 6	Routh stability criterion.
Week 7	Block diagram representation.
Week 8	Definition, Block diagram reduction.
Week 9	Signal flow graphs.
Week 10	Control system classification Definition of order.
Week 11	Type and steady state error constants.
Week 12	Transient response analysis.
Week 13	First impulse and step responses
Week 14	Second order impulse and step responses

Week 15	Stability
Week 16	Lead and lag compensators design

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Ogata-Modern-Control-5th-txtbx,	Yes
Recommended Texts		No
Websites	https://electrical-minds.blog.coml/2014/12/modern-control-engineering-5th-edition.html?m=1	

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

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

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Optical Fibers**			**Module Delivery**	
Module Type	Core			☒ **Theory** ☐ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	LAER412				
ECTS Credits	7				
SWL (hr/sem)	175				
Module Level	4		**Semester of Delivery**	7	
Administering Department	Type Dept. Code		**College**	Type College Code	
Module Leader	Dr. Rasha K. Al-Dabagh Dr. Wurood A. Khaleed		**e-mail**	Rasha.k.aldabagh@nahrainuniv.edu.iq Wurood.a.khaleel@nahrainuniv.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	To provide students with the design and operating principles of modern optical communication systems. Upon completion of the subject, students should be

	familiar with different types of optical fibers and commonly used components in optical communication systems.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	After completing this course the students should be able to: 1. Learn the basic elements of optical fiber transmission link, fiber modes configurations, structures and their applications in telecommunication. 2. Understand the various types of optical fibers, including single-mode fibers and multimode fibers, and their properties. 3. Analyzing the factors that affect the performance of optical fibers in communication systems, such as attenuation, dispersion and nonlinearities. 4. Learn different types of modulation and demodulation techniques used in optical fiber communication. 5. Describe the fundamental principles of optical communication systems, including light sources, detectors, and modulators. 6. Design and implement optical communication systems using appropriate simulation software tools. 7. Evaluate the different types of optical fiber amplifiers and their applications in long-haul communication systems. 8. Analyze the principles of optical networking, including wavelength-division multiplexing (WDM) and optical switching.
Indicative Contents المحتويات الإرشادية	1. Geometrical-Optics Description (step-index fibers, graded index fibers, numerical aperture, optical modes, TIR, photonic band gap and cut-off wavelength). 2. Fiber losses (attenuation coefficient, transmission windows, material absorption, Rayleigh scattering, waveguide imperfections, connectors, loss budget) 3. Dispersion in optical fiber (group velocity dispersion, material dispersion and waveguide dispersion) 4. Dispersion managements (zero-dispersion wavelength, flatten optical fiber and dispersion compensation fiber) 5. Nonlinearities in optical fiber (stimulated light scattering, self-phase modulation and four wave mixing). 6. Fiber design and fabrication. 1. Coherent optical communication 2. Receiver Design (Front End, Linear Channel , Decision Circuit and clock circuits)

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	78	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	5
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	97	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	4.5
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**175**		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	2	10% (10)	5 and 10	LO #2, #3 and #5, #7
	Assignments	4	10% (10)	2, 4 and 10, 12	LO #1, #4 and #6, #7
	Projects / Lab.	1	10% (10)	Continuous	All
	Report/classroom activities	1	10% (10)	13	LO #2, #5 and #8
Summative assessment	**Midterm Exam**	2hr	10% (10)	7 and 14	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	Geometrical-Optics Description
Week 2	Fiber losses
Week 3	Dispersion in optical fiber
Week 4	Dispersion managements
Week 5	Nonlinearities in optical fiber
Week 6	Fiber design and fabrication.

Week 7	Exam 1
Week 8	Optical communications (Basic concepts) and Optical Signal Generation
Week 9	Transmitter Design
Week 10	WDM, FDM and TDM techniques.
Week 11	Optical amplifiers
Week 12	Basic Concepts of optical receiver
Week 13	Non-Coherent and Coherent optical communication
Week 14	Exam 2
Week 15	Receiver Design, Receiver noise calculation

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Types of optical fibers and connectors
Week 2	Measuring the attenuation in optical fiber
Week 3	Measuring the numerical aperture and acceptance angle
Week 4	Fusion splicing of optical fiber
Week 5	Introduction to Optiwave
Week 6	Compensation of Dispersion with Fiber Bragg Grating Component
Week 7	Direct Intensity Modulation
Week 8	Wavelength Division Multiplexing (WDM) Design

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	• Optical Fiber Communication, 3rd Edition, J. M. Senior, 2009 • Fiber Optic Communication Systems – Govind P. Agarwal , John Wiley, 3rd Ediition, 2004.	
Recommended Texts		
Websites		

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks %**	**Definition**
Success Group (50 - 100)	**A** - Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors

	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX –** Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

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

MODULE DESCRIPTION FORM
نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Laser Design Technology**			**Module Delivery**	
Module Type	Core			☒ **Theory** ☐ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	LAER420				
ECTS Credits	7				
SWL (hr/sem)	175				
Module Level	4		**Semester of Delivery**	8	
Administering Department			**College**		
Module Leader	Dr. Dina Yaqoob Matti		**e-mail**	dina.y.alsaka@nahrainuniv.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	LAER222	**Semester**	4
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 first objective is to explain the types of lasers and pumping of each type, while the second is to definition and derive all parameters related to design of laser systems.**
Module Learning Outcomes	Upon completion of a module on laser design technology, learners are expected to: 1. Understand the principles of laser technology and their applications in

مخرجات التعلم للمادة الدراسية	various industries. 2. Demonstrate knowledge of the properties of laser beams, including their wavelength, power, coherence, and polarization. 3. Demonstrate an understanding of the different types of lasers, including solid-state, gas, and semiconductor lasers, and their respective applications. 4. Be familiar with the design and construction of laser systems, including the laser cavity, beam delivery system, and control electronics. 5. Understand the importance of optics in laser systems and be able to design and select appropriate optical components. 6. Demonstrate proficiency in the use of software tools for laser system design and simulation. 7. Be familiar with laser safety regulations and best practices in laser safety. 8. Demonstrate teamwork and communication skills through group projects related to laser system design and optimization.
Indicative Contents المحتويات الإرشادية	Types of Discharge (4hrs) Fundamental Processes (4hrs) Electrical Considerations (4hrs) Breakdown (4hrs) Self-Sustained Discharge (6hrs) Atomic and Molecular Lasers (4hrs) CW and Pulsed CO_2 Lasers (4hrs)

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	6
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	82	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	5.5
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**175**		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	2	10% (10)	5 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)	7,14	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	Types of Discharge
Week 2	Types of Discharge Cont.
Week 3	Fundamental Processes
Week 4	Fundamental Processes Cont.
Week 5	Electrical Considerations
Week 6	Electrical Considerations Cont.
Week 7	Midterm exam 1
Week 8	Breakdown
Week 9	Self-Sustained Discharge
Week 10	Self-Sustained Discharge Cont.
Week 11	Self-Sustained Discharge Cont.
Week 12	Atomic and Molecular Lasers
Week 13	Atomic and Molecular Lasers Cont.
Week 14	Midterm exam 2
Week 15	CW and Pulsed CO_2 Lasers

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

Week 1	Lab 1: Main power supply of flash lamp
Week 2	Lab 2: Trigger circuit of flash lamp
Week 3	Lab 3: He-Ne laser system
Week 4	Lab 4: Alignment of He-Ne
Week 5	Lab 5: Ne laser system
Week 6	Lab 6: Co_2 laser system
Week 7	Lab 7: Nd: YAG laser system

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	1. SOLID-STATE LASER ENGINEERING, BY WALTER KOECHNER, 5TH EDITION, SPRINGER BERLIN, YORK, 1999. 2. LASER FUNDAMENTALS, BY WILLIAM T. SILFVAST, 2ND EDITION, CAMBRIDGE UNIVERSITY PR	
Recommended Texts		
Websites		

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

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

MODULE DESCRIPTION FORM
نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	Digital Image Processing			**Module Delivery**	
Module Type	Core			☒ **Theory** ☐ **Lecture** ☒ **Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	LAER421				
ECTS Credits	4				
SWL (hr/sem)	100				
Module Level	4		**Semester of Delivery**	8	
Administering Department			**College**		
Module Leader	Ali Adnan Khalil		**e-mail**	ali.a.al-temeemy@nahrainuniv.edu.iq	
Module Leader's Acad. Title	Asst. Professor		**Module Leader's Qualification**	Ph.D.	
Module Tutor			**e-mail**		
Peer Reviewer Name			**e-mail**		
Scientific Committee Approval Date			**Version Number**		

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

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	1. To develop problem solving skills and understanding of digital image processing. 2. To understand Image Sensing and Acquisition. 3. This course deals with the basic concept of image enhancement in the spatial domain. 4. To understand linear and non-linear spatial filters.

	5. To perform processing color image.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	This course tends to provide the student with fundamentals of digital image processing and its applications. 1. Define the scope of the field that we call image processing and give a historical perspective of the origins of this field. 2. Discuss briefly the principal approaches used with digital image processing. 3. Summarize the imaging sensors and how they used to generate digital image. 4. Introduces the concepts of uniform image sampling and quantization. 5. Define the relationships between pixels. 6. Discuss the image enhancement in the spatial domain. 7. Summarize Gray level transformation. 8. Apply contrast stretching, Gray-level and Bit-plane slicing. 9. Use of histogram processing for image enhancement. 10. Summarize basics of linear spatial filtering (smoothing and sharpening spatial filters). 11. Summarize basics of Non-linear spatial filtering 12. Apple color image processing for digital image enhancement.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. <u>Introduction to Digital Image Processing</u> Digital Image Processing Origins and Fields (Gamma-Ray Imaging, X-ray Imaging, Imaging in Ultraviolet-Visible-Infrared-Microwave-Radio Bands), Fundamental Steps in Digital Image Processing, Components of Digital Imaging System. [6 hrs] <u>Digital Image Fundamentals</u> Image Sensing and Acquisition (using a Single Sensor, Sensor Strips, Sensor Arrays with Image Formation Model), Image Sampling and Quantization (Concepts in Sampling and Quantization, Presenting Digital Images, Spatial and Gray-Level Resolution), Relationships Between pixels (Neighbors of a Pixel, Adjacency, Connectivity, Regions, Boundary, Distance Measures, Image Operations on a Pixel Basis), Linear and Nonlinear Operations. [9 hrs] <u>Image Enhancement in the Spatial Domain</u> Gray Level Transformations (Image Negatives, Log Transformations, Power-Law Transformation, Piecewise-Linear Transformation Functions {Contrast Stretching, Gray-level slicing, and Bit-plane slicing}), Histogram Processing and Equalization, Enhancement using Arithmetic/Logic Operations (Image Subtraction and averaging), Basics of Spatial Filtering, Smoothing Spatial Filters (Smoothing Linear Filters , Order-Statistic Filters), Sharpening Spatial Filters (Use of Second Derivatives for Enhancement-The Laplacian, Use of the First Derivatives for Enhancement-The Gradient). [19 hrs]

	Color Image Processing Color Fundamentals, Color Models (The RGB Color Model, The CMY and CMYC Color Model, The HIS Color Model {Converting Color from RGB to HIS, Converting Color from HIS to RGB}), Pseudo color Image Processing (Intensity Slicing, Gray Level to Color Transformations), Basics of Full-Color Image Processing. [9 hrs] Revision problem classes. [3 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	78	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	5
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	22	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	1.5
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**100**		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	5	10% (10)	Continuous	All
	Assignments	2	10% (10)	12 and 15	LO #9 #10 and #11, #12
	Projects / Lab.	7	10% (10)	Continuous	All
	Report	7	10% (10)	Continuous	All

Summative assessment	**Midterm Exam**	2hr	10% (10)	7	LO #1 - #8
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Digital Image Processing Origins and Fields (Gamma-Ray Imaging, X-ray Imaging, Imaging in Ultraviolet-Visible-Infrared-Microwave-Radio Bands)
Week 2	Fundamental Steps in Digital Image Processing, Components of Digital Imaging System.
Week 3	Image Sensing and Acquisition (using a Single Sensor, Sensor Strips, Sensor Arrays with Image Formation Model)
Week 4	Image Sampling and Quantization (Concepts in Sampling and Quantization, Presenting Digital Images, Spatial and Gray-Level Resolution)
Week 5	Relationships Between pixels (Neighbors of a Pixel, Adjacency, Connectivity, Regions, Boundary, Distance Measures, Image Operations on a Pixel Basis), Linear and Nonlinear Operations.
Week 6	Gray Level Transformations (Image Negatives, Log Transformations, Power-Law Transformation, Piecewise-Linear Transformation Functions {Contrast Stretching, Gray-level slicing, and Bit-plane slicing})
Week 7	Mid-term Exam + Histogram Processing
Week 8	Histogram Equalization, Enhancement using Arithmetic/Logic Operations
Week 9	Image Subtraction and averaging
Week 10	Basics of Spatial Filtering, Smoothing Spatial Filters (Smoothing Linear Filters, Order-Statistic Filters)
Week 11	Sharpening Spatial Filters (Use of Second Derivatives for Enhancement-The Laplacian)
Week 12	Use of the First Derivatives for Enhancement-The Gradient
Week 13	Color Fundamentals, Color Models (The RGB Color Model, The CMY and CMYC Color Model, The HIS Color Model {Converting Color from RGB to HIS, Converting Color from HIS to RGB}),
Week 14	Pseudo color Image Processing (Intensity Slicing)
Week 15	Gray Level to Color Transformations, Basics of Full-Color Image Processing.
Week 16	**Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: Introduction to MATLAB image processing toolbox
Week 2-3	Lab 2: Effects of Changes in Resolution and Quantization
Week 4-5	Lab 3: Image Enhancement using Negative, Log, and Power law Transformations
Week 6-7	Lab 4: Image Enhancement using Histogram Equalization

Week 8-10	Lab 5: Image Enhancement using averaging
Week 11-13	Lab 6: Image Processing using Linear Filters
Week 14-15	Lab 7: Image Processing using non-Linear Filters

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Digital Image Processing, by Rafael Gonzalez, Second Edition.	No
Recommended Texts	Digital Image Processing using Matlab, by Rafael Gonzalez, Second Edition.	No
Websites		

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

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

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	Intelligent Control Engineering			**Module Delivery**	
Module Type	Core			☒ **Theory** ☐ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	LAER422				
ECTS Credits	5				
SWL (hr/sem)	125				
Module Level	4		**Semester of Delivery**	8	
Administering Department	Type Dept. Code		**College**	Type College Code	
Module Leader	Alaa siham hamid		**e-mail**	Alqadia43@gmail.com	
Module Leader's Acad. Title	Assist lecture		**Module Leader's Qualification**	MS.C	
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	LAER 210, 220	**Semester**	2,4
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 control theory through the application of techniques. 2. To understand set point, controller, system, feedback and output variable from a given block diagram. 3. This course deals with the basic concept of control theory. 4. This is the basic subject for all control and control theory. 5. To understand amplitude and phase to different frequency. 6. To understand open loop system and closed loop system. 7. To understand linear differential equation, laplace transform and transfer function. 8. Define each of the element PID controller.

Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Recognize how control works in control theory. 2. List the various terms associated with control theory. 3. Summarize what is meant by a basic control theory. 4. Discuss the system stability analysis. 5. Describe set point, controller, system, feedback and output variable. 6. Identify the basic control elements and their applications.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. Definition of Bode plot diagram of the frequency response of system, root locus plot indicates how the closed loop poles of a system vary with a system parameter ,what is Nyquist plot , definition of nyquist plot of representing the frequency response of linear system. , Polar plot, Definitions, vector in space, basis, change of basis, [15 hrs] Solution of the state-space equation, construction of the state –space from the transfer function, determining the transfer function from the state-space equation, stability analysis, observability and controllability.[15 hrs] Definitions, drawing of phase, trajectory of nonlinear and linear2nd order differential equation, state space representation. [10 hrs] Revision problem classes [6 hrs]

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The main strategy that will be adopted in delivering this module is to encourage students' participation 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	6
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	32	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	2.5
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	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	Bode plot, Cont. Bode plot.
Week 2	root locus, Cont. root locus
Week 3	Nyquist, Cont. Nyquist.
Week 4	Polar plot.
Week 5	Definitions, Vector in Space, Basis, Change of Basis
Week 6	Solution of the State-Space Equation
Week 7	Construction of the State- Space from the Transfer Function
Week 8	Determining the Transfer Function from The state- Space Equation
Week 9	Stability Analysis
Week 10	Observability and Controllability
Week 11	Observability and Controllability
Week 12	Definitions
Week 13	Drawing of Phase
Week 14	Trajectory of Nonlinear and Linear 2^{nd} Order Differential Equation.
Week 15	State Space Representation.

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: Introduction of matlab

Week 2	Lab 2: Time domain analysis of a 2nd order loop system using block diagram reduction by matlab
Week 3	Lab 3: Time- domain analysis of control systems
Week 4	Lab 4:Root locus method of analysis
Week 5	Lab 5: The PID controller design
Week 6	Lab 6: Frequency Response analysis

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Ogata-Modern-Control-5th-txtbx,	Yes
Recommended Texts		No
Websites	https://electrical-minds.blog.coml/2014/12/modern-control-engineering-5th-edition.html?m=1	

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

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

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Optical Communications**			**Module Delivery**	
Module Type	Core			☒ **Theory** ☐ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	LAER423				
ECTS Credits	6				
SWL (hr/sem)	150				
Module Level	4		**Semester of Delivery**	8	
Administering Department	Type Dept. Code		**College**	Type College Code	
Module Leader	Dr. Rasha K. Al-Dabagh Dr. Wurood A. Khaleed		**e-mail**	Rasha.k.aldabagh@nahrainuniv.edu.iq Wurood.a.khaleel@nahrainuniv.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	LAER 323	**Semester**	6
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 provide students with the design and operating principles of modern optical communication systems. Upon completion of the subject, students should be

	familiar with different types of optical fibers and commonly used components in optical communication systems.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	After completing this course the students should be able to: 1. Learn the basic elements of optical fiber transmission link, fiber modes configurations, structures and their applications in telecommunication. 2. Understand the various types of optical fibers, including single-mode fibers and multimode fibers, and their properties. 3. Analyzing the factors that affect the performance of optical fibers in communication systems, such as attenuation, dispersion and nonlinearities. 4. Learn different types of modulation and demodulation techniques used in optical fiber communication. 5. Describe the fundamental principles of optical communication systems, including light sources, detectors, and modulators. 6. Design and implement optical communication systems using appropriate simulation software tools. 7. Evaluate the different types of optical fiber amplifiers and their applications in long-haul communication systems. 8. Analyze the principles of optical networking, including wavelength-division multiplexing (WDM) and optical switching.
Indicative Contents المحتويات الإرشادية	1. Basic concepts (Lightwave System Components, optical transmitter, types of single mode semiconductor lasers and LED) 2. Optical Signal Generation (direct modulation, external modulation and modulation formats (PSK, and QSK)). 3. Transmitter Design (Source-Fiber Coupling and Driving Circuitry) 4. WDM, FDM and TDM techniques. 5. Optical amplifiers (semiconductor optical amplifier, Erbium-doped fiber amplifier and Raman amplifier 6. Basic Concepts of optical receiver (Responsivity, Quantum Efficiency, Rise Time and Bandwidth). 7. Non-Coherent optical communication 8. Coherent optical communication 9. Receiver Design (Front End, Linear Channel , Decision Circuit and clock circuits)

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	63	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	87	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	5.8
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**150**		

Module Evaluation
تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	2	10% (10)	5 and 10	LO #2, #3 and #5, #7
	Assignments	4	10% (10)	2, 4 and 10, 12	LO #1, #4 and #6, #7
	Projects / Lab.	1	10% (10)	Continuous	All
	Report/classroom activities	1	10% (10)	13	LO #2, #5 and #8
Summative assessment	**Midterm Exam**	2hr	10% (10)	7 and 14	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	Geometrical-Optics Description
Week 2	Fiber losses
Week 3	Dispersion in optical fiber
Week 4	Dispersion managements
Week 5	Nonlinearities in optical fiber
Week 6	Fiber design and fabrication.
Week 7	Exam 1
Week 8	Optical communications (Basic concepts) and Optical Signal Generation
Week 9	Transmitter Design

Week 10	WDM, FDM and TDM techniques.
Week 11	Optical amplifiers
Week 12	Basic Concepts of optical receiver
Week 13	Non-Coherent and Coherent optical communication
Week 14	Exam 2
Week 15	Receiver Design, Receiver noise calculation

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Types of optical fibers and connectors
Week 2	Measuring the attenuation in optical fiber
Week 3	Measuring the numerical aperture and acceptance angle
Week 4	Fusion splicing of optical fiber
Week 5	Introduction to Optiwave
Week 6	Compensation of Dispersion with Fiber Bragg Grating Component
Week 7	Direct Intensity Modulation
Week 8	Wavelength Division Multiplexing (WDM) Design

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	• Optical Fiber Communication, 3rd Edition, J. M. Senior, 2009 • Fiber Optic Communication Systems – Govind P. Agarwal , John Wiley, 3rd Ediition, 2004.	
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.				