الجامعة العراقية
كلية الهندسة
برنامج الهندسة الكهربائية
وفق مسار بولونيا

للعام الدراسي 2025/ 2026

Academic Program Description Form

University: Al-Iraqia Unniversity

Faculty: College of Engineering

Department: Electrical Engineering Department

Academic Program: Bachelor in Electrical Engineering

Certificate of Graduation: Bachelor in Electrical Engineering

Study Mode: Full time / Bologna Process

Form Preparation Date: 20/11/2024

Signature: BMAlbaker

A. Prof. Dr. Baraa Munqith Albaker
Head of Electrical Engineering Department
College of Engineering, Al-Iraqia University

Head of the Department

Date: 20/11/2024

Signature:

Dr. Omar Hassan Hameed
Deputy Dean for Scientific Affairs
College of Engineering

Deputy Dean of Scientific Affairs

Date: 20/11/2024

كلية الهندسة
وحدة ضمان الجودة
الصادر

The form is reviewed by:

College Division of Quality Assurance and University Performance

Signature

Head of the Division: Dr. Suhail Naim Abdullah

Date: 20/11/2024

Approval of the Dean of the College

الملحق رقم (1)

تصميم المنهاج الدراسي

لقسم الهندسة الكهربائية

Curriculum Design for Electrical Engineering

Al-Iraqia University	الجامعة العراقية
Bachelor's level (First cycle) - Bachelor degree in Electrical Engineering	مستوى البكالوريوس (الدورة الأولى) - بكالوريوس في الهندسة الكهربائية
Four years (Eight semesters) - 240 ECTS credits - 1 ECTS = 25hr	أربع سنوات (ثمانية فصول دراسية) - ٢٤٠ وحدة اوربية - كل وحدة اوربية = ٢٥ ساعة
Program Curriculum (2024 - 2025)	المنهاج الدراسي للعام ٢٠٢٤-٢٠٢٥

Level	Semester	No.	Module Code	Module Name in English	اسم المادة الدراسية	Language	SSWL (hr/w)						Exam hr/sem	SSWL hr/sem	USSWL hr/sem	SWL hr/sem	ECTS	Module Type	Prerequisite Module(s) Code
							CL (hr/w)	Lect (hr/w)	Lab (hr/w)	Pr (hr/w)	Tut (hr/w)	Semn (hr/w)							
UGI	One	1	ENLA102	English Language I	اللغة الانكليزية 1	English	2						4	32	18	50	2.00	B	
		2	PHY102	Physical Electronics	الإلكترونيات الفيزيائية	English	5				1		4	88	62	150	6.00	B	
		3	MAT103	Mathematics I	الرياضيات 1	English	5				1		4	88	62	150	6.00	B	
		4	DCC104	DC Electrical Circuits	دوائر التيار المستمر	English	4		2				6	90	60	150	6.00	C	
		5	COMP105	Computer	الحاسوب	English	4		2				6	90	60	150	6.00	C	
		6	WSP106	Workshop	الورشة	English			2				2	30	20	50	2.00	B	
		7	HRAD103	Human Rights and Democracy	الديمقراطية وحقوق الانسان	Arabic	2						4	32	18	50	2.00	S	
						Total	22	0	6	0	2	0	30	450	300	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/sem	ECTS	Module Type	Prerequisite Module(s) Code
							CL (hr/w)	Lect (hr/w)	Lab (hr/w)	Pr (hr/w)	Tut (hr/w)	Semn (hr/w)							
UGI	Two	1	MAT121	Mathematics II	الرياضيات 2	English	5				1		4	88	87	175	7.00	B	
		2	EDR122	Engineering Drawing	الرسم الهندسي	English			2				4	32	18	50	2.00	S	
		3	ACC123	AC Electrical Circuits	دوائر التيار المتناوب	English	3		2		1		6	90	60	150	6.00	C	DCC104
		4	MEC124	Principles of Mechanical Engineering	مبادئ الهندسة الميكانيكية	English	4						4	60	65	125	5.00	S	
		5	DTC125	Digital Techniques	التقنيات الرقمية	English	4		4				6	118	82	200	8.00	C	
		6	ARLA101	Arabic Language I	اللغة العربية 1	Arabic	2						4	32	18	50	2.00	B	
						Total	18	0	8	0	2	0	28	420	330	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/sem	ECTS	Module Type	Prerequisite Module(s) Code
							CL (hr/w)	Lect (hr/w)	Lab (hr/w)	Pr (hr/w)	Tut (hr/w)	Semn (hr/w)							
UGII	Three	1	MAT201	Mathematics III	الرياضيات 3	English	4						4	60	65	125	5.00	B	MAT103
		2	ELE202	Electronics I	الالكترونيات 1	English	2		2		1		6	76	74	150	6.00	C	DCC104
		3	NAS203	Networks and Systems	الشبكات والانظمة	English	2		2		1		6	76	74	150	6.00	C	DCC104
		4	DCM204	DC Machines and Transformers	مكائن التيار المستمر والمحولات	English	4		3		1		6	118	82	200	8.00	C	
		5	EEC205	Engineering Economics	الاقتصاديات الهندسية	English	2						4	32	43	75	3.00	E	
		6	CBRI104	Crimes of the Baath Regime in Iraq	جرائم نظام البعث في العراق	Arabic	2						4	32	18	50	2.00	B	
						Total	16	0	7	0	3	0	30	394	356	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/sem	ECTS	Module Type	Prerequisite Module(s) Code
							CL (hr/w)	Lect (hr/w)	Lab (hr/w)	Pr (hr/w)	Tut (hr/w)	Semn (hr/w)							
UGII	Four	1	PNS221	Probability and Statistics	الاحتمالات والاحصاء	English	3						4	46	54	100	4.00	B	
		2	INC222	Induction Machines	المكائن الحثية	English	2		2				6	62	63	125	5.00	C	
		3	CPR223	Computer Programming	برمجة الحاسوب	English	4		2				6	90	60	150	6.00	B	
		4	APH224	Applied Physics	الفيزياء التطبيقية	English	4						4	60	65	125	5.00	B	PHY102
		5	ELE225	Electronics II	الالكترونيات 2	English	3		2				6	76	74	150	6.00	C	PHY102
			ARLA201	Arabic Language II	اللغة العربية 2	Arabic	2						4	32	18	50	2.00	B	
		6	ENLA202	English Language II	اللغة الانكليزية 2	English	2						4	32	18	50	2.00	B	
						Total	20	0	6	0	0	0	34	398	352	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/sem	ECTS	Module Type	Prerequisite Module(s) Code
							CL (hr/w)	Lect (hr/w)	Lab (hr/w)	Pr (hr/w)	Tut (hr/w)	Semn (hr/w)							
UGIII	Five	1	MAN301	Mathematical Analysis	التحليلات الرياضية	English	3						4	46	54	100	4.00	B	
		2	AEL302	Advanced Electronics	الالكترونيات المتقدمة	English	3		4		1		6	118	82	200	8.00	C	ELE202
		3	SYC303	Synchronous Machines	المكائن المتزامنة	English	2		2				6	62	63	125	5.00	C	
		4	COM304	Communications I	الاتصالات 1	English	3		2		1		6	90	85	175	7.00	C	EAN301
		5	ETH226	Engineering Ethics	اخلاقيات الهندسة	English	2						4	32	43	75	3.00	S	
		6	PRM306	Project Management	ادارة المشروع	English	2						4	32	43	75	3.00	E	
						Total	15	0	8	0	2	0	30	380	370	750	30.00		
UGIII	Semester	No.	Module Code	Module Name in English	اسم المادة الدراسية	Language	SSWL (hr/w)						Exam hr/sem	SSWL hr/sem	USSWL hr/sem	SWL hr/sem	ECTS	Module Type	Prerequisite Module(s) Code
							CL (hr/w)	Lect (hr/w)	Lab (hr/w)	Pr (hr/w)	Tut (hr/w)	Semn (hr/w)							
	Six	1	APR321	Antenna and Propagation	الهوائيات والانتشار	English	4		2				6	90	60	150	6.00	C	MAT121
		2	MPR322	Microprocessors	المعالجات الدقيقة	English	4		2				6	90	60	150	6.00	C	DTC125
		3	COM323	Communications II	الاتصالات 2	English	2		2		1		6	76	49	125	5.00	C	
		4	NAN324	Numerical Analysis	التحليلات العددية	English	3						4	46	54	100	4.00	B	
		5	POW325	Fundamentals of Electrical Power	اساسيات القدرة الكهربائية	English	4				2		4	88	62	150	6.00	C	ACC123
		6	RMW326	Research Methodology and Academic Writing	منهجية البحث والكتابة الاكاديمية	English	2						4	32	43	75	3.00	S	
						Total	19	0	6	0	3	0	30	422	328	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/sem	ECTS	Module Type	Prerequisite Module(s) Code
							CL (hr/w)	Lect (hr/w)	Lab (hr/w)	Pr (hr/w)	Tut (hr/w)	Semn (hr/w)							
	Seven	1	ESY401	Embedded Systems	الانظمة المضمنة	English	3						4	46	54	100	4.00	C	DTC125
		2	PSA402	Power Systems Analysis	تحليل انظمة القدرة	English	3						4	46	54	100	4.00	C	POW325
		3	CNT403	Control Systems I	انظمة التحكم 1	English	3		2		1		6	90	60	150	6.00	C	NAS203
		4	PWE404	Power Electronics	الكترونيات القدرة	English	4		2				6	90	60	150	6.00	C	ELE202
		5	DEL405	Digital Electronics	الالكترونيات الرقمية	English	3				1		4	60	65	125	5.00	C	DTC125
		6	PRJ406	Graduation Project I	المشروع الهندسي 1	English	2			2			2	58	67	125	5.00	C	
						Total	18	0	4	2	2	0	26	390	360	750	30.0		
UGIV	Semester	No.	Module Code	Module Name in English	اسم المادة الدراسية	Language	SSWL (hr/w)						Exam hr/sem	SSWL hr/sem	USSWL hr/sem	SWL hr/sem	ECTS	Module Type	Prerequisite Module(s) Code
							CL (hr/w)	Lect (hr/w)	Lab (hr/w)	Pr (hr/w)	Tut (hr/w)	Semn (hr/w)							
	Eight	1	DSP421	Digital Signal Processing	معالجة الاشارات الرقمية	English	3				1		4	60	65	125	5.00	C	EAN301
		2	RSG422	Renewable Energy and Smart Grid	الطاقة المتجددة والشبكة الذكية	English	2		2				6	62	63	125	5.00	C	ACC123
		3	CNT423	Control Systems II	انظمة التحكم 2	English	3		2		1		6	90	60	150	6.00	C	DSP421
		4	ITC424	Information Theory and Coding	نظرية المعلومات والترميز	English	2				1		4	46	54	100	4.00	C	
		5	PRJ425	Graduation Project II	مشروع التخرج 2	English	2			2			2	58	67	125	5.00	C	PRJ406
		6	AIN426	Artificial Intelligence	الذكاء الاصطناعي	English	2		2				6	62	63	125	5.00	E	
						Total	14	0	6	2	3	0	28	378	372	750	30.0		
						Total	142	0	51	4	17	0	236	3232	2768	6000	240.0		Must be 240 ECTS

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

Structured SWL (hr/w) type			Module type				
CL	Class Lecture		B	Basic learning activities	SWL:	Student Workload
Lab	Laboratory		C	Core learning activity	SSWL:	Structured SWL
Pr	Practical Training		S	Suport or related learning activity	USSWL:	Unstructured SWL
Tut	Tutorial		E	Elective learning activity		
Lect	Online lecture					
Semn	Seminar					

				University Requirements																	
				Engineering Requirements																	
				Department Requirement																	

الملحق رقم (2)

دليل البرنامج الدراسي

لقسم الهندسة الكهربائية

Program Catalog for Electrical Engineering

Al–Iraqia University

الجامعة العراقية

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

بكالوريوس علوم في الهندسة الكهربائية

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1. Mission & Vision Statement

Vision Statement

The department becomes distinct and pioneer at the local and regional levels in the field of electrical engineering by offering a modern and advanced academic program in accordance with local, regional and international standards, empowering qualified nationals to work and providing scientific, technical and applied advice in the labor market.

Mission Statement

Developing competent and highly qualified engineers who are able to meet the needs of the labor market in the public and private sectors in the field of electrical engineering, by updating the curricula according to the rapid developments of modern technology and dynamic requirements changes of the market. Also, providing students of the department with the latest knowledge and advanced theoretical and practical skills, and encouraging students to be creative and innovative. In addition to the department's endeavor to develop new study programs for postgraduate studies to keep pace with the advanced and recent developments in the specialization.

2. Program Specification

Programme code:	BSc-EE	**ECTS**	240
Duration:	4 levels, 8 Semesters	**Method of Attendance:**	Full Time

Electrical Engineering discipline is considered interdisciplinary in character, which encapsulates three major directions: computer and control, electronics and communication, and power and machines. The program is concerned with the study, design, and application of equipment, devices, and systems which use electricity, electronics, communication, etc.

Electrical engineers work in a wide range of areas, including electrical and electronic circuits, communications, antenna and propagation, renewable energy, smart grids, power systems, machines, computer programming, artificial intelligence, signal processing, embedded system, etc. Through the well-structured program, the department offers B.Sc. degree in electrical engineering when the student passes eight semesters and collects 240 ECTS units.

The program grants a bachelor's degree in electrical engineering after completing four academic years. Design and analysis of systems is at the core of our program. According to the college and Al-Iraqia university mission statements, graduates from the department will gain necessary basic and advanced knowledge in the field to allow them to be highly qualified engineers in scientific, practical and research applications to engage them in the public and private sectors

Students are introduced to the fundamentals of engineering in Level 1, which is appropriate for advancement to all programs in the group of engineering programs. Electrical engineering program-specific core subjects are studied at Level 2 in order to prepare for research-led subject specialized modules at Levels 3 and 4. In level 4, students will have experience with research through their graduation project, where they must show how to resolve a realistic problem.

3. Strategic Objectives of the Program (Program Goals)

1- To graduate well-educated engineers who possess a wide range of knowledge in the field of electrical engineering and able to develop themselves as well as to work in the public and private sectors.

2- To obtain national and international accreditations and continuously update the curricula using appropriate and up-to-date theoretical and

practical teaching methods and techniques according to the international standards to enable students to meet the needs of the labor market.

3- To foster cooperation with the corresponding engineering departments and research centers to enhance the scientific level of the students and the teaching staff.

4- To enable the student to conduct scientific researches, organizing seminars, participating in scientific conferences and workshops inside the country and abroad.

5- To enrich the students with the required knowledge to work on solving practical and applied issues.

6- To focus on postgraduate studies to raise the level of scientific research to provide universities, institutes, research centers and organizations with well qualified higher degrees holders.

7- To integrate with other related engineering disciplines in order to bridge the gaps of scientific and applied researches.

8- To provide academic and engineering consultancy services in the field of electrical engineering and its applications, including systems design, supervision and engineering management, in accordance with the market's needs and requirements.

4. Program Educational Objectives (PEOs)

1. To prepare graduates to establish successful professional careers as practicing engineers or consultants in electrical engineering and related fields within the private and public sectors
2. To prepare graduates with the academic and research skills necessary to pursue self-development and advanced studies in electrical engineering.
3. To serve the community by fostering innovation, addressing societal challenges, and providing technical solutions.
4. To cultivate a lifelong learning mindset, enabling graduates to adapt to technological advancements and develop their professional competencies.

6. Student Learning Outcomes

Outcome 1: An ability to distinguish, identify, define, formulate, and solve electrical engineering problems by applying principles of engineering, science and mathematics.

Outcome 2: An ability to produce engineering designs in the field of electrical engineering that meet desired needs within certain constraints by applying both analysis and synthesis in the design process.

Outcome 3: An ability to create and carry out proper measurement and tests in the field of electrical engineering with quality assurance, analyze and interpret results, and utilize engineering judgment to make inferences.

Outcome 4: An ability to skillfully communicate orally with a gathering of people and in writing with various managerial levels.

Outcome 5: An ability to perceive ethical and professional responsibilities in electrical engineering cases and make brilliant judgments taking into account the consequences in worldwide financial, ecological and societal considerations.

Outcome 6: An ability to perceive the continual necessity for professional knowledge growth and how to find, assess, assemble and apply it properly.

Outcome 7: An ability to work adequately on teams and to set up objectives, plan activities, meet due dates, and manage risk and uncertainty.

7. Academic Staff

The academic staff is listed in the following table:

Khamis Awad Zidan Email: khamis_zidan@aliraqia.edu.iq	Ph.D. in Communication and computer Engineering	Professor
Mohammed Nasser Hussain Al - Turfi Email: mohammed_alturfi@yahoo.com	Ph.D. in Electrical Engineering, Computer and Control	Professor
Malik Abdulrazzaq Jabbar Email: maliksaady@yahoo.com	Ph.D. in Electrical Engineering	Professor
Baraa Munqith Albaker	Ph.D. in Electrical Engineering, Computer and Control	Professor

Email: baraaalbaker@aliraqia.edu.iq		
Ahmed Khalaf Saleh Email: dr.ahmedkhlf@gmail.com	Ph.D. in Fluid mechanics	Assistant Professor
Farqad Talib Najim Email: farqad_alani@yahoo.com	Ph.D. in Heat Transfer fluid flow Energy storage	Assistant Professor
Bashar Sakeen Farhan Email: basharfarhan@yahoo.com	Ph.D. in Electrical Power System	Assistant Professor
Anas Fouad Ahmed Email: anasfuad33eng@yahoo.com	M.Sc. in Electrical engineering	Assistant Professor
Ayad Mahmood Kwad Email: ayad_m_k@yahoo.com	Ph.D. in Mechatronics and robot engineering	Lecturer
Mohammed Khalid Ibraheem Email: Alobaidi.m.k.i@gmail.com	Ph.D. in Communication engineering	Lecturer
Hussein jumma jabir Email: hjjahmn@gmail.com	Ph.D. in Electrical engineering, power systems	Lecturer
Khalid J. Kazim Email: Khalid.j.kazim@gmail.com	Ph.D. in Mechatronics Engineering, Robotics Control	Lecturer
Wassan Saad abduljabbar hayale Email: Wassan.hayale@aliraqia.edu.iq	Ph.D. in Computer Engineering	Lecturer
Rasha Subhi Ali Email: danafush@gmail.com	Ph.D. in Computer Science	Lecturer
Mustafa Subhi Kamsl Email: mustafasubhi1967@gmail.com	Ph.D. in Communication engineering	Lecturer
Firas Ali Jawad Al-Hasani Email: firasissa75@gmail.com	Ph.D. in Electrical and Electronic Engineering	Lecturer
Ruaa Muthana Ali Email: ruaaalmusa@gmail.com	Ph.D. in Medical Physics	Lecturer

Ali Kadim Hantoosh alialmousoi2006@yahoo.com	Ph.D. in Semiconductor physics-Solar cells	Lecturer
Qasim Hadi Kareem Email: Qasim.hadi2017@gmail.com	Ph.D. in Communication Engineering	Lecturer
Ayad Tahseen Abdulhafedh Email: adalhadithy@gmail.com	M.Sc. in Electrical power	Assistant Lecturer
Alaa Mageed Ali Email: alaamajeed1984@gmail.com	M.Sc. in Electrical and Electronic Engineering	Assistant Lecturer
Layth Abdulsattar Jasim Email: layth.jasim@aliraqia.edu.iq	M.Sc. in Computer Engineering	Assistant Lecturer
Hiba hadi kurdi Email: hiba199160@gmail.com	M.Sc. in Power Engineering	Assistant Lecturer
Mays Afif Email: mays.afif@gmail.com	M.Sc. in Information Technology	Assistant Lecturer
Zaid Abdulmahdi Abdulghaffar Al-Anssari za_peterpan_id@yahoo.com	M.Sc. in Electrical Engineering	Assistant Lecturer
Asmaa Falih Jassm Email: asmaafalih2@gmail.com	M.Sc. in Islamic belief and thought	Assistant Lecturer
Ahmed Naji Zaidan Email: ahmed87m88@gmail.com	M.Sc. in electric power engineering	Assistant Lecturer
Ali Jasim Mohammed Email: ali.laser4@gmail.com	M.Sc. in Electrical Engineering, Electronic and communication	Assistant Lecturer
Alaa Hussein Abdulaal Engineeralaahussein@gmail.com	M.Sc. in Electrical and Electronic Engineering	Assistant Lecturer

Mustafa mohammed jawad abed mustafa.utem@gmail.com	M.Sc. in Electronic engineering, communication system technique	Assistant Lecturer

8. Credits, Grading and GPA

Credits

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

Grading

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

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

Calculation of the Cumulative Grade Point Average (CGPA)

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

CGPA = [(1^{st} module score x ECTS) + (2^{nd} module score x ECTS) + ……] / 24

9. Curriculum/Modules

Semester 1 | 30 ECTS | 1 ECTS = 25 hrs

Code	Module	SSWL	USSWL	ECTS	Type	Pre-request
ENGLA102	English Language I	32	18	2.00	Base	None
PHY102	Physical Electronics	88	62	6.00	Base	None
MAT103	Mathematics I	74	51	5.00	Base	None
DCC104	DC Electrical Circuits	104	71	7.00	Core	None
COMP105	Computer	90	60	6.00	Base	None
WSP106	Workshop	30	20	2.00	Base	None
HRAD103	Human Rights and Democracy	32	18	2.00	Support	None

Semester 2 | 30 ECTS | 1 ECTS = 25 hrs

Code	Module	SSWL	USSWL	ECTS	Type	Pre-request
MAT121	Mathematics II	88	87	7.00	Base	None
EDR122	Engineering Drawing	32	18	2.00	Support	None
ACC123	AC Electrical Circuits	90	60	6.00	Core	DCC104
MEC124	Principles of Mechanical Engineering	60	65	5.00	Support	None
DTC125	Digital Techniques	118	82	8.00	Core	None
ARLA101	Arabic Language I	32	18	2.00	Support	None

Semester 3 | 30 ECTS | 1 ECTS = 25 hrs

Code	Module	SSWL	USSWL	ECTS	Type	Pre-request
MAT201	Mathematics III	60	65	5.00	Base	MAT103
ELE202	Electronics I	76	74	6.00	Core	DCC104
NAS203	Networks and Systems	76	74	6.00	Core	DCC104
DCM204	DC Machines and Transformers	118	82	8.00	Core	None
EEC205	Engineering Economics	32	43	3.00	Elective	None
CBRI104	Crimes of the Baath Regime in Iraq	32	18	2.00	Support	None

Semester 4 | 30 ECTS | 1 ECTS = 25 hrs

Code	Module	SSWL	USSWL	ECTS	Type	Pre-request
PNS221	Probability and Statistics	46	54	4.00	Base	None
INC222	Induction Machines	62	63	5.00	Core	None
CPR223	Computer Programming	90	60	6.00	Base	None
APH224	Applied Physics	60	65	5.00	Core	PHY102
ELE225	Electronics II	76	74	6.00	Core	PHY102
ARLA201	Arabic Language II	32	18	2.00	Base	None
ENLA202	English Language II	32	18	2.00	Base	None

Semester 5 | 30 ECTS | 1 ECTS = 25 hrs

Code	Module	SSWL	USSWL	ECTS	Type	Pre-request
EAN301	Engineering Analysis	46	54	4.00	Base	None

AEL302	Advanced Electronics	118	82	8.00	Core	ELE202
SYC303	Synchronous Machines	62	63	5.00	Core	None
COM304	Communications I	90	85	6.00	Core	EAN301
PRM306	Project Management	32	43	3.00	Elective	None
ETH226	Engineering Ethics	32	43	3.00	Support	None

Semester 6 | 30 ECTS | 1 ECTS = 25 hrs

Code	Module	SSWL	USSWL	ECTS	Type	Pre-request
APR321	Antenna and Propagation	90	60	6.00	Core	MAT121
MPR322	Microprocessors	90	60	6.00	Core	DTC125
COM323	Communications II	76	49	5.00	Core	None
NAN324	Numerical Analysis	46	54	4.00	Base	None
POW325	Fundamentals of Electrical Power	88	62	6.00	Core	ACC123
RMW326	Research Methodology and Academic Writing	32	43	3.00	Support	None

Semester 7 | 30 ECTS | 1 ECTS = 25 hrs

Code	Module	SSWL	USSWL	ECTS	Type	Pre-request
ESY401	Embedded Systems	46	54	4.00	Elective	DTC125
PSA402	Power Systems Analysis	46	54	4.00	Core	POW325
CNT403	Control Engineering I	90	60	6.00	Core	NAS203
PWE404	Power Electronics	90	60	6.00	Core	ELE202

DEL405	Digital Electronics	60	65	5.00	Core	DTC125
PRJ406	Graduation Project I	58	67	5.00	Core	None

Semester 8 | 30 ECTS | 1 ECTS = 25 hrs

Code	Module	SSWL	USSWL	ECTS	Type	Pre-request
DSP421	Digital Signal Processing	60	65	5.00	Core	EAN301
RSG422	Renewable Energy and Smart Grid	62	63	5.00	Elective	ACC123
NT423	Control Engineering II	90	60	6.00	Core	DSP421
ITC424	Information Theory and Coding	46	54	4.00	Core	None
PRJ425	Graduation Project II	58	67	5.00	Core	PRJ406
AIN426	Artificial Intelligence	60	65	5.00	Elective	None

10. Contact

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الملحق رقم (3)

دليل المواد الدراسية

لقسم الهندسة الكهربائية

Modules Catalog for Electrical Engineering

Al-Iraqia University
College of Engineering

First Cycle – Bachelor's Degree (B.Sc.) – Electrical Engineering

بكالوريوس - هندسة كهربائية

Table of Contents

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1. Overview

This catalogue is about the courses (modules) given by the program of Electrical Engineering to gain the Bachelor of Science degree. The program delivers (50) Modules with (6000) total student workload hours and 240 total ECTS. The module delivery is based on the Bologna Process.

نظره عامه

يتناول هذا الدليل المواد الدراسية التي يقدمها برنامج الهندسة الكهربائية للحصول على درجة بكالوريوس العلوم. يقدم البرنامج (49) مادة دراسية مع (٦٠٠٠) إجمالي ساعات حمل الطالب و ٢٤٠ إجمالي وحدات أوروبية. يعتمد تقديم المواد الدراسية على عملية بولونيا.

2. Undergraduate Courses 2024-2025

Module 1

Code	Course/Module Title	ECTS	Semester
ENLA102	English Language I	2	1
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	0	32	18
Description			
This English language course is designed to develop students' core skills in reading, writing, listening, and speaking for academic and professional contexts. It emphasizes grammar, vocabulary building, pronunciation, and effective communication strategies. Through interactive lessons, group discussions, writing assignments, and multimedia resources, students will enhance their ability to understand and produce English accurately and fluently. The course also focuses on developing academic skills such as summarizing, paraphrasing, and presenting ideas clearly, which are essential for success in university studies and the workplace. A strong emphasis is placed on the use of English in real-life situations and technical fields, enabling students to apply their language skills in diverse environments. By the end of the course, students will be more confident and competent in using English in both written and spoken forms, prepared for further academic challenges.			

Module 2

Code	Course/Module Title	ECTS	Semester
PHY102	Physical Electronics	6	1
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
5	1	88	62
Description			

This course enables the student to understand and apply the following concepts:

- Atomic structure, the dual nature of matter, energy levels, quantum numbers, and crystal structure.
- The ability to analyze electronic ballistics.

electron mobility, explain conduction in metals, describe semiconductors, their types, and the Fermi energy level.

- The diode, its types, structure and properties, analyzing its circuits, and studying its most important applications in electronic circuits.
- Introducing to the basic principles of the BJT transistor, its structure and characteristics.

Module 3

Code	Course/Module Title	ECTS	Semester
MAT103	Mathematics I	6	1
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
5	1	74	51
Description			

This module covers a wide range of topics, including algebra, trigonometry, calculus, and transcendental functions. Students will develop skills in problem-solving, critical thinking, and mathematical modeling, which are crucial for analyzing and solving engineering problems.

The module begins with a review of algebraic operations and equations, ensuring students have a strong foundation in manipulating mathematical expressions. It then progresses to trigonometry, introducing concepts such as angles, triangles, and trigonometric functions, which are essential for engineering applications involving forces, waves, and oscillations.

Calculus forms a significant part of the module, where students learn both differential and integral calculus. They will explore concepts such as limits, derivatives, and integration techniques, enabling them to analyze rates of change, optimize engineering processes, and understand the principles of motion and accumulation.

Module 4

Code	Course/Module Title	ECTS	Semester
DCC104	DC Electrical Circuits	6	1
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
4	2	104	71
Description			

An electrical circuit course is a specialized educational program that focuses on teaching the principles, theory, and practical aspects of working with DC circuits. This course provides students with a comprehensive understanding of how DC circuits function and how to design, analyze, and troubleshoot them.
The course starts with an introduction to basic electrical concepts, including voltage, current, resistance, and power. Students learn about Ohm's law and how it applies to DC circuits, as well as Kirchhoff's laws that govern the behavior of current and voltage in complex circuit configurations.
Students then delve into the components of a DC circuit, such as resistors, capacitors, inductors, and switches. They learn how to calculate and measure voltage, current, and resistance using appropriate instruments and techniques.
The course covers circuit analysis techniques, including series and parallel circuit configurations, voltage and current division, and the use of circuit theorems such as Thevenin's and Norton's theorems.
Furthermore, students are introduced to design DC circuits. They gain hands-on experience by building and testing real-world DC circuits in laboratory settings, troubleshooting circuit issues, and understanding the importance of safety precautions.

By the end of the course, students should have a solid foundation in DC circuit theory and practical skills, enabling them to work with and analyze DC circuits in a variety of applications.

Module 5

Code	Course/Module Title	ECTS	Semester
COMP105	Computer	6	1
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
4	2	90	60
Description			

This course plan is designed to provide first-year students with a strong computer science and programming foundation. It begins with introducing essential computer concepts, including hardware components and networking, followed by an exploration of memory, CPU, storage, and system buses.
The course will cover computer languages, flowcharts, and algorithms, before moving on to the fundamentals of C++ programming. Key topics include C++ syntax, data types, operators, control structures, loops, functions, arrays, and string manipulation.
Additionally, the plan includes a midterm exam and a preparation week for the final exam. By the end of the course, students will have the skills needed to solve both basic and advanced programming problems using C++.
Concepts of C++ programming are made very simple and easy. Every topic is covered in greater detail.

Module 6

Code	Course/Module Title	ECTS	Semester
WSP106	Workshop	2	1
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
0	2	30	20
Description			
Technical workshop aims to improve the student's skills that deals with an electronic component and any physical entity in an electronic system used to affect the electrons or their associated fields in a manner consistent with the intended function of the electronic system. Components are generally intended to be connected together, usually by being soldered to a printed circuit board (PCB), to create an electronic circuit with a particular function (for example an amplifier, radio receiver, or oscillator). Components may be packaged singly, or in more complex groups as integrated circuits. Some common electronic components are capacitors, inductors, resistors, diodes, transistors, etc. Components are often categorized as active (e.g. transistors and thyristors) or passive (e.g. resistors, diodes, inductors and capacitors.			

Module 7

Code	Course/Module Title	ECTS	Semester
HRAD103	Human Rights and Democracy	2	1
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	0	32	18
Description			
أن ما يجب ان يعلمه الطالب ان حقوق الانسان هي المبادئ الأخلاقية أو المعايير الاجتماعية التي تضع لنا نموذجاً للسلوك البشري الذي يُفهم عموما بأنه مجموعة من الحقوق الأساسية التي لا يجوز المس بها او التعرض لها وهي حقوق اصيلة ومستحقة لكل فرد لمجرد كونه إنسان، فهي ملاصقة لهم بغض النظر عن لونهم او لغتهم أو ديانتهم أو أصلهم العرقي او هويتهم أو أو أي وضع آخر يدعوا للتمييز او التفريق بينهم . قد يواجه الطلاب في حياتهم العلمية او العملية المستقبلية الكثير من المواقف التي يجب ان يحتكم فيها الانسان الى العقل والانسانية حيث تفرض عليه احترام الحقوق الإنسانية للآخرين , فللجميع حقوق وبإقرار هذه الحقوق و الحريات فإن المرء يستطيع أن يتمتع بالأمن والأمان، ويصبح قادراً على اتخاذ القرارات التي تنظم حياته وهذا ما يساعد الطالب على احترام والاعتراف بالكرامة المتأصلة لدى الأسرة البشرية وبحقوقها المتساوية الثابتة يعتبر ركيزة أساسية للحرية والعدل وتحقيق السلام في العالم. .تغطي مادة حقوق الانسان الكثير من المواضيع التي لها علاقة بحياة الفرد وتحدد سلوكه مع محيطه الخارجي (للفرد والمجتمع) فتحقق له الدراسة اسباب نشأة حقوق الانسان ووتوضح الاعلان العالمي والفرنسي لتلك الحقوق, كما تبين تطور فكرة حقوق الانسان من خلال المعاهدات والمواثيق الخاصة به , كما تسلط الضوء على مساله مهمة جدا وهو ما يهمنا ان نغرسه في روح ابنائنا الطلبة قبل دخولهم في سوق العمل الا وهي ظاهرة الفساد الاداري ببيان تأثيرها وسلبياتها على الفرد والمجتمع كما نطرح اهم المعالجات الواجب اتخذها للحد من تلك الظاهرة ، والكثير من المواضيع التي من خلالها يعرف الطالب حقوقه وواجباته تجاه المجتمع لضمان حياة حرة كريمه للجميع .			

Model 8

Code	Course/Module Title	ECTS	Semester
MAT121	Mathematics II	7	2
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
5	1	88	87
Description			
The aims of the module are to introduce engineering students to the central role that mathematics plays in the development and practice of engineering. To help students to begin to develop the skill of analyzing problems in a rational (rigorous, logical) and methodical manner. To develop the students' ability to transfer their mathematical understanding (and the associated methods) to diverse engineering application areas. Topics covered are: Vectors: introduction to vectors, vector representation, vector operation, dot product, cross product, triple product, equation of line and planes in space, intersection planes, vector functions and their derivatives, curvature, unit normal vector, binomial vector, torsion, Tangent and normal component, Partial derivatives: first order partial derivatives, Higher order partial derivatives, Chain rule, wave equation, Laplace equation, total differential, Maxima, minima, and saddle points, Gradients, directional derivative and tangent planes, Sequence and infinite series: power series, and Fourier series.			

Module 9

Code	Course/Module Title	ECTS	Semester
EDR122	Engineering Drawing	2	2
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
0	2	32	18
Description			
The engineering drawing course aims to clearly understand all the engineering properties of an entity or product, and the main objective of the engineering drawing is to communicate the basic information that enables the executor to implement this component. mechanical drawing, or machinery drawing are all engineering technical languages, just like any language used in understanding and transfer Engineering ideas among people, whether by design (preparing drawings) or by reading (studying previously prepared drawings), and engineering drawing will give the student a language that has rules, foundations and methods that can only be practiced by those who studied it properly and completely, drawing language is used as a means of understanding between specialists to understand what they want to create, produce, and manufacture products for use in life. Also, the engineering drawing course will enable the student to keep documents related to inventions and designs, so that it is easy to refer to them when needed. The course will be in two stages, the first stage drawing using engineering tools and the second stage using computer programs such as AUTOCAD.			

Module 10

Code	Course/Module Title	ECTS	Semester
ACC123	AC Electrical Circuits	6	2
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
3	3	90	60
Description			
An electrical circuit course is a specialized educational program that focuses on teaching the principles, theory, and practical aspects of working with AC circuits. This course provides students with a comprehensive understanding of how AC circuits function and how to design, analyze, and troubleshoot them. The course starts with an introduction to basic AC electrical concepts, including voltage, current, Impedance and Admittance, and complex power. Students learn about Ohm's law and how it applies to AC circuits, as well as Kirchhoff's laws that govern the behavior of alternating current and voltage in complex circuit configurations. Students then delve into the components of a AC circuit, such as resistors, capacitors, inductors, and switches. They learn how to calculate and measure voltage, current, using appropriate instruments and techniques. The course covers circuit analysis techniques, including series and parallel circuit configurations, voltage and current division, and the use of circuit theorems such as Thevenin's and Norton's theorems. Furthermore, The topics covered in this course include: AC circuit theory, the complex representation of sinusoidal varying quantities such as Voltage and Current, also Apparent, Active and Reactive power. This course also highlights the different disciplines in electrical engineering to be studied by the students during their undergraduate study such as three-phase system and analysis it. By the end of the course, students should have a solid foundation in AC circuit theory and practical skills, enabling them to work with and analyze AC circuits in a variety of applications.			

Module 11

Code	Course/Module Title	ECTS	Semester
MEC124	Principles of Mechanical Engineering	5	2
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
4	0	60	65
Description			
Mechanics is the study of the motion and forces that govern the behavior of objects. Mechanics is used to design and analyze mechanical systems, from simple machines to complex structures. It encompasses several subfields, including statics, dynamics, and kinematics. Statics is concerned with the forces that act on objects that are at rest, while dynamics is concerned with the forces that act on objects that are in motion. Kinematics, meanwhile, is concerned with the motion of objects without regard to the forces that cause that motion. In addition to the study of the relationship between heat, energy, and work. Thermodynamics is used to design and analyze engines, refrigeration systems, and other mechanical systems that involve heat transfer.			

Module 12

Code	Course/Module Title	ECTS	Semester
DTC125	Digital Techniques	8	2
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
4	4	118	82
Description			
The module begins by introducing students to the fundamental concepts of digital logic, including Boolean algebra, logic gates, and truth tables. Students will learn how to represent and manipulate binary logic functions using logic gates such as AND, OR, NOT, and XOR, enabling them to construct and simplify complex logical expressions. Next, students will explore combinational logic circuits, which perform logical operations based on the current input values. They will study various building blocks such as encoders, decoders, multiplexers, and de-multiplexers. Students will learn to design and analyze these circuits, understand their functionality, and appreciate their applications in data manipulation and control systems. The module also covers sequential logic circuits, which introduce the concept of memory and enable the storage and processing of data over time. Students will delve into flip-flops, registers, and counters, gaining the ability to design and analyze circuits that store and manipulate digital information.			

Module 13

Code	Course/Module Title	ECTS	Semester
ARLA101	Arabic Language I	2	2
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	0	32	18
Description			
يكتسب الطالب الإحكام والقواعد الأساسية للغة العربية الفصحى وتطبيقها من خلال الامثلة المستنبطة من الحياة اليومية للطالب من خلال التعامل اللغوي في المجتمع. ويتعرف الطالب على مهارات الكتابية والتعبيرية الشفوية لكي يكتسب الأسلوب الصحيح في التعبير الكتابي والشفاهي والوقوف على مواطن الخطأ لتصويب الأداء اللغوي الذي يعبر عن افكاره ومشاعرهِ وحاجاتهِ اليومية ،من خلال إتقان مهارة الكتابة الصحيحة بمعرفة قواعد الإملاء ولاسيما مواضع الأخطاء الشائعة. ويتعرف الطالب كتابة الأداء الصوتي بشكل مضبوط من حيث النطق السليم لمختلف اصوات اللغة بشكليها الاصوات الصحيحة والأصوات المعتلة. أما من حيث قواعد التركيب اللغوي السليم فان الدرس يتعرض إلى أهم الأخطاء الشائعة في التعبير اللغوي العام ولاسيما أحكام العدد واحكام تركيب الجملة الاسمية من المبتدأ والخبر والجملة الفعلية من حيث الفعل والفاعل والمفعول به وأحكام صياغة المشتقات الشائعة في الاستعمال مثل اسم الفاعل واسم المفعول واسما الزمان والمكان ، والتطرق إلى موضوعات شائعة اخرى ينبغي على الطالب إتقانها على الوجه الصحيح مثل احكام التثنية والجمع والتأنيث والتذكير. وبهذه المفردات يكتسب الطالب اهم الأحكام التي تجعله على مستوى جيد في التعبير السليم والتي تنمي فيه الحس الفكري بما يؤدي إلى توسيع مدارك الطالب وفهمهِ جوانب حياتهِ العلمية والعملية.			

Module 14

Code	Course/Module Title	ECTS	Semester
MAT201	Mathematics III	5	3
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
4	0	60	65
Description			
The aims of the module are to introduce engineering students to the central role that mathematics plays in the development and practice of engineering. To help students to begin to develop the skill of analyzing problems in a rational (rigorous, logical) and methodical manner. To develop the students' ability to transfer their mathematical understanding (and the associated methods) to diverse engineering application areas. Topics covered are: Ordinary Deferential Equation (O.D.E): First Order (O D.E), 2nd Order Homogenous, 2nd Order non- Homogenous, Multiple Integral, Application of Multiple Integral, Laplace Transform, Inverse Laplace Transform, and Differential Equation using Laplace Transform.			

Module 15

Code	Course/Module Title	ECTS	Semester
ELE202	Electronics I	6	3
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	3	76	74
Description			
The course aims to foster the development of students' analytical and problem-solving skills, with a specific focus on the field of electronics. Through a combination of theoretical knowledge and practical applications, students will acquire a strong foundation in analytical methods and strategies relevant to electronic systems. 1. Bipolar junction transistors (BJTs), 2. DC biasing of BJT, 3. BJT as a switch , Stability factor of BJT and compensation techniques. 4. AC analysis of BJT,			

Module 16

Code	Course/Module Title	ECTS	Semester
NAS203	Networks and Systems	6	3
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	3	76	74
Description			
The course aims developing students analytical and problem solving skills. It introduces methods of modeling and analyzing of complex electrical networks and systems. Complex networks and systems can be modeled by only accessing their input and output terminals using two port parameters. Circuits containing mutual inductance are modeled and analyzed. Behavior of electrical network or system can be studied through finding its transfer function. This can be done by finding the frequency response of the transfer function. Bod plot is introduced to simplify finding the frequency response. Stability concept is presented by studying the poles of the transfer function. Passive filter networks are studied. Two types of passive filters are introduced, these are the constant-k and m-derived filters. The concept of resonance is introduced. Resonance RLC circuits are studied. The concept of transient is introduced. Transient circuits are analyzed.			

Module 17

Code	Course/Module Title	ECTS	Semester
DCM204	DC Machines and Transformers	8	3
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
4	4	118	82
Description			
The course delivers a comprehensive understanding on the basic concept in machines, it consists of two main sections; DC Machines and Transformers. Through the course, students learn the essential principles of DC generators, DC motors, Single phase transformers and Three phase transformers. The course describes the principle operation of DC machines, it first describes DC generator construction, armature reaction and commutation, methods of excited, types of DC generators as well as the characteristics of DC generators. This followed by an explanation of DC motor principle of operation, characteristics and types. It also emphasis torque equation and speed control of DC motors. The second part of the module focuses on transformers, it explains the construction, theory, E.M.F equation and fundamental principles of single phase transformers. In addition, the module illustrates different essential subjects like; voltage drop in transformers, transformers tests, transformers rating and voltage regulation. It also describes methods of calculating the losses and the efficiency of transformers besides conditions for maximum efficiency and percentage resistance, reactance and impedance. Moreover, the course emphasizes three phase transformer construction, connection and reasons for parallel operation. The course enables students to gain the required knowledge about machines and prepares them to the next levels of their studies.			

Module 18

Code	Course/Module Title	ECTS	Semester
EEC205	Engineering Economics	3	3
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	0	32	43
Description			
Engineering Economics is a course that introduces students to the principles of economic analysis and their application in engineering decision-making. It covers topics such as cost accounting, time value of money, financial analysis, risk assessment, and project evaluation. The course aims to provide students with the necessary tools and techniques to evaluate the economic feasibility of engineering projects, make informed investment decisions, and manage financial resources effectively. Students learn to analyze cash flows, calculate metrics like net present value and internal rate of return, assess project risks, and consider factors such as inflation and taxation. Through case studies and real-world examples, students gain practical insights into the economic implications of engineering decisions and develop skills in critical thinking, problem-solving, and financial analysis. The course equips students with a solid foundation in engineering economics, enabling them to make economically sound decisions and contribute to the financial success of engineering projects and organizations.			

Module 19

Code	Course/Module Title	ECTS	Semester
CBRI104	Crimes of the Baath Regime in Iraq	2	3
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	0	32	18
Description			
ارتكب نظام البعث في العراق إبّان حكمه عدداً كبيرا مَّن الجرائم المختلفة، واختلافها يلْزم بيان مفاهيم وتعاريف للطالب ليكون على معرفة ودراية بما يمر به مما لها علاقة بمادة المنها ج ، كمفهوم الجريمة وأقسامها، والجرائم الدولية التي حُكِم عليها قيادات وأزلام نظام البعث وفق قانون المحكمة الجنائية العراقية العليا لقد تضمن هذا المنهجُ ما جاء مفاتيحَ معرفية بيدِ الطالبِ الجامعيّ يقَوَى بها على كلّ مُرتجَ حَبكَت رواية أكُذوبته أيَادي البعثِ وإعلامُه المزيفِّ ، وباعت ضميرَها أنَفسُ ترى أنَ تبقى إلى الآنَ ذليلة أسَيرة ، وذيَلًا تابعاً.			

Module 20

Code	Course/Module Title	ECTS	Semester
PNS221	Probability and Statistics	4	4
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
3	0	46	54
Description			
Probability and Statistics introduce students to exploring data, sampling and experimentation by planning and conducting studies, anticipating patterns using probability and simulation, and employing statistical inference to analyze data and draw conclusions. This module: introduces the basic concepts of probability theory and statistics, illustrated by a full range of examples and applications; introduces an important statistical computing package; provides secure and solid foundations for higher level probability and mathematical statistics modules, This module provide further study of probability theory, in particular as it relates to multivariate random variables, and to introduce formal concepts and methods in statistical estimation. The module also introducing tools to understand the notion of joint statistics - the study of two or more random variables which may be correlated.			

Module 21

Code	Course/Module Title	ECTS	Semester
INC222	Induction Machines	5	4
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	2	62	63
Description			
The course delivers a comprehensive understanding on the basic concept in induction machines machines, it consists of two main sections: Three phase induction machines and single phase induction machines. Through the course, students learn the essential principles of induction machines. The course describes the principle operation of induction machines machines, it first describes Production of rotating field. Reversal of magnetic field rotation. three phase induction machines construction, This followed by an explanation Power and torque of three phase induction motor, torque speed characteristics of three phase induction motor methods of starting and speed control of three phase induction motors, test and efficiency. In the end of this section induction generator is explained. The second part of the module focuses on single phase motors, revolving field theory and cross field theory. Analysis of single-phase IM using double revolving field theory, and explains the construction, and equivalent circuit of single phase induction motor. In addition, the module illustrates the principles of Universal and single-phase AC series motor and single phase repulsion motors			

Module 22

Code	Course/Module Title	ECTS	Semester
CPR223	Computer Programming	6	4
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
4	2	90	60
Description			
This course introduces Electrical Engineering students to MATLAB, a high-level programming language and interactive computing environment that is widely used for numerical computation, data analysis, and engineering applications. The curriculum aims to help students understand the fundamentals of MATLAB programming, covering key concepts such as syntax, variables, arrays, matrices, control structures, file handling, and data visualization. It also provides powerful graphics capabilities for creating 2D and 3D plots and animations. Students will explore MATLAB's powerful built-in functions and specialized toolboxes applicable in areas such as signal processing, system modeling, and machine learning. The emphasis is on practical skills through labs and projects, which enable students to tackle real-world engineering problems effectively. The course also includes an introduction to Simulink, a graphical modeling tool integrated with MATLAB that allows users to simulate dynamic systems using block diagrams. By the end of the course, students will be proficient in developing scripts, solving mathematical models, and presenting data efficiently. The concepts of MATLAB programming are presented in a clear and straightforward manner, with every topic addressed in practical and applied detail.			

Module 23

Code	Course/Module Title	ECTS	Semester
APH224	Applied Physics	5	4
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
4	0	60	65
Description			
This Course provides an introduction to Electromagnetic Fields. The fields are the electrical and magnetic. First,the semester is started with vector calculation that contain the important subjects (the three coordinates system).The coordinates are the Cartesian, Cylindrical and Spherical coordinate's system. After that the electrical field will begin. The electric field includes the electrostatic study of vacuum or space for all charge distributions, whether it is charge, line charge density, surface charge density and volume charge density. Second, The electric field includes, during its study, the identification of important laws, including Coulomb's law for electric forces, as well as Gauss's law for electric flux, Maxwell's law for the propagation of electric field lines, and the study of electric potential and their relationship to the electric field. After that the electric field is finished by studying the electric field in material and how the medium is changed specially in different types of capacitors. Now the magnetic field began how this field arises, whether it is from a permanent magnet or from an electromagnet, according to the theory of Oersted and Faraday and Ampere's law for all the different current distributions that form the magnetic field. Then, the strength of the magnetic field and the magnetic flux, which are circular paths, are identified, and Maxwell's law, which is related to the magnetic field, is studied. Then study the magnetic potential and magnetic circuits. Finally, the			

importance of electromagnetic fields is to inform the students that they are the origin of the work of electrical machines, electrical networks, telecommunications, and other materials.

Module 24

Code	Course/Module Title	ECTS	Semester
ELE225	Electronics II	6	4
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
3	2	76	74
Description			
The course aims to foster the development of students' analytical and problem-solving skills, with a specific focus on the field of electronics. Through a combination of theoretical knowledge and practical applications, students will acquire a strong foundation in analytical methods and strategies relevant to electronic systems.			

Module 25

Code	Course/Module Title	ECTS	Semester
ARLA201	Arabic Language II	2	4
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	0	32	18
Description			
يكتسب الطالب الإحكام والقواعد الأساسية للغة العربية وتطبيق قواعدها بصورة علمية ودقيقة، بما يعزز الكفاءة اللغوية والقدرة على التواصل الفصيح والكتابة السليمة، ومن أهمها ما يأتي: 1 . إدراك البنية الأساسية للجملة العربية من خلال التمييز بين أقسام الكلام (الاسم، الفعل، الحرف) وتحليل الوظائف النحوية لكل منها. 2. التمييز بين المعرب والمبني في الأسماء والأفعال، وفهم قواعد البناء والإعراب وأثرهما في المعنى. 3. إتقان قواعد الجمع بأنواعه (جمع المذكر السالم، المؤنث السالم، جمع التكسير) وتطبيقها في التراكيب النحوية المختلفة. وكذلك فهم الفروق بين المعرفة والنكرة والتعامل مع أنواع المعارف بدقة (الضمير، اسم الإشارة، الموصول، المعرف بـ"أل"، وغيرها) واستيعاب قواعد التذكير والتأنيث في الأسماء والصفات، وتوظيفها في التراكيب الصحيحة. 4. تحليل الجمل الاسمية والفعلية، والتعرف على النواسخ الفعلية (كان وأخواتها) والحرفية (إن وأخواتها) وأثرها في تغيير الإعراب والمعنى وكذلك دراسة أفعال المقاربة والرجاء والشروع من حيث تركيبها النحوي واستخدامها في السياقات المناسبة. 5. القدرة على إعراب الجمل والنصوص إعرابًا تامًا، واكتساب مهارات التحليل النحوي المنهجي. 6. تمييز وتصحيح الأخطاء اللغوية الشائعة في الكتابة والتحدث، مما يعزز سلامة اللغة لدى الطالب، وتعزيز مهارات الطالب في الكتابة الأكاديمية والخطاب الفصيح، بما يؤهله للبحث العلمي، والتدريس، والتحرير، والعمل الإعلامي أو الثقافي.			

Module 26

Code	Course/Module Title	ECTS	Semester
ENLA202	English Language II	2	4
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	0	32	18
Description			
The main purpose of the course is to provide knowledge about the English language, improve communication skills in English, improve critical writing skills, increase literary skills, explain the principal types of grammar, make it capable to evaluate and analyses sentences. Students taking this course spend their time reading scientific essays, and other pieces of science. Student will be able to communicate in a Basic English medium with his friends. Along with this, in this English course, various types of activities including teamwork and seminar are also added to its curriculum studies. In addition to that, students will respond to English activity with thoughtful formal and informal speaking. They will explore the power of grammar through the study of the spoken word. Students will read silently at varying speeds depending on the purpose of reading; adopt different strategies for different types of text; recognize the organization of a text. This course, the student who does this course helps a lot in reading English, getting information about English, increasing his speaking speed in English, and writing English. This course will concentrate on speaking, listening, writing and reading.			

Module 27

Code	Course/Module Title	ECTS	Semester
MAN301	**Mathematical Analysis**	4	5
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
3	0	46	54
Description			
Engineering analysis heavily relies on the concepts and techniques covered by Fourier Transform, Laplace Transform, Z-Transform, Matrix Analysis, and Partial Differential Equations. These tools play a vital role in understanding and solving complex engineering problems across various disciplines. The Fourier Transform properties, convolution theorem, power spectral density, and correlation are used to analyze and manipulate signals in engineering applications. They provide insights into the frequency components of signals, allowing engineers to design and optimize systems for specific frequency ranges. Signal and linear systems analysis utilizing Fourier Transform helps in tasks such as filtering, noise reduction, and modulation. The Laplace Transform is extensively employed in engineering to study the behavior of linear systems. Its existence, convergence, and properties aid in characterizing system responses and stability. The Laplace Transform also finds applications in circuit analysis, where it enables the analysis of transient and steady-state responses, as well as in solving ordinary differential equations arising in various engineering problems. The Z-Transform is particularly useful in the analysis of discrete-time systems. Engineers utilize the			

region of convergence and the properties of Z-transform to study system stability, impulse responses, and frequency characteristics in discrete domains. The inverse Z-Transform is applied to reconstruct signals from their transformed counterparts, facilitating system analysis and design. Matrix analysis, including linear transformations, eigenvalues, and eigenvectors, forms an integral part of engineering analysis. Engineers employ matrix theory to solve systems of linear equations, analyze transformations, and study the behavior of multivariable systems. Laplace transforms of matrices are utilized in electrical circuit analysis to solve complex network problems and determine system responses. Partial Differential Equations (PDEs) are extensively used in engineering to describe physical phenomena. The wave equation and Laplace's equation are examples of PDEs that commonly arise in various engineering domains. Solving boundary condition problems using PDEs helps engineers understand and predict phenomena such as heat transfer, fluid flow, and structural vibrations. The general solution techniques, including separation of variables, aid in solving complex boundary value problems encountered in engineering practice.

In summary, the concepts and techniques covered by Fourier Transform, Laplace Transform, Z-Transform, Matrix Analysis, and Partial Differential Equations are essential tools in engineering analysis. They enable engineers to analyze, design, and solve a wide range of engineering problems across different domains, from signal processing and circuit analysis to system dynamics and partial differential equations.

Module 28

Code	Course/Module Title	ECTS	Semester
AEL302	Advanced Electronics	8	5
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
3	5	118	82
Description			

The advanced electronics module encompasses a range of topics including frequency response, multistage frequency effects, feedback amplifiers, operational amplifiers, op-amp applications, active filters, oscillators, and power amplifiers. Within this module, students gain an understanding of the underlying principles, analysis techniques, and practical applications related to these areas in the field of electrical engineering. The emphasis of the module lies in the design and analysis of electronic circuits and systems. To reinforce theoretical knowledge and develop practical skills, students engage in hands-on laboratory work, projects, and real-world applications. The module covers various aspects such as frequency response analysis, the impact of cascading amplifiers and filters, characteristics of feedback amplifiers, fundamental concepts of operational amplifiers, design of active filters, principles of oscillators, and considerations for power amplifiers. Ultimately, upon completion of the module, students possess a solid foundation in electronics, enabling them to analyze, design, and troubleshoot electronic circuits and systems with proficiency.

Module 29

Code	Course/Module Title	ECTS	Semester
SYC303	Synchronous Machines	5	5
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	2	62	63
Description			
The course delivers a comprehensive understanding on the basic concept in synchronous machines, it consists of two main sections; Synchronous generator and synchronous motors. Through the course, students learn the essential principles of. The course describes the principle operation of synchronous machines, it first describes synchronous machines construction, EMF equation, Winding distribution in Ac machines. Chording and distribution factors, armature reaction. This followed by an explanation of synchronous generators principle of operation: alone and in parallel with infinite bus and with two generators of the same size. The second part of the module focuses on synchronous motors, it explains the construction, and equivalent circuit and phasor diagram. In addition, the module illustrates different essential subjects like; Steady state synchronous motor operation, Power-factor control, and Starting of synchronous motor.			

Module 30

Code	Course/Module Title	ECTS	Semester
COM304	Communications I	7	5
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
3	3	90	85
Description			
The module of Communication I, provides a comprehensive understanding of the fundamental principles and concepts underlying Analog communication systems, including signal transmission, modulation and demodulation. Students will able to understand the concepts of the signals representation and transmission to Analog communication system. The module describes different types of linear modulation, including DSBSC, DSB with carrier, SSB and angle modulations such as frequency and phase modulations techniques. It identifies the components of Analog communication system and explains different concepts such as noise, distortion, bandwidth, modulation and demodulation. It recognizes the basics of angle (exponential) (frequency and phase) modulation and important concepts such as instantaneous frequency to learn the angle (Frequency and phase) modulation. It describes the superhytrodyne receiver and Phase Locked Loop (PLL) principle. Students will design and analyze the functionality of the block diagrams of different systems that are usually used in the linear modulation and demodulation techniques including, Amplitude Modulation (AM), Double Sideband – Suppressed Carrier (DSB-SC), Single Side-Band (SSB), Vestigial Side-Band (VSB) and Angle Modulation (FM, PM). They represent the signals in time domain and frequency domain and evaluate Bandwidth efficiency for modulated signals. They also, will design and analyze demodulation techniques such as linear demodulation and Angle demodulation to recover the original information from transmission signals. Students will learn to connect analog communication modules to build different types of modulation and demodulation techniques in the Lab using Matlab Simulink to represent the output waveform of signals and analyze the results.			

Module 31

Code	Course/Module Title	ECTS	Semester
ETH305	Engineering Ethics	3	5
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	0	32	43

Description

An engineering ethics course is designed to provide students with a comprehensive understanding of ethical principles and practices in the field of engineering. This course explores the moral, social, and professional responsibilities of engineers and aims to cultivate ethical awareness, critical thinking, and decision-making skills. Here is a description of an engineering ethics course:

The engineering ethics course delves into the ethical dimensions of engineering practice, equipping students with the knowledge and tools to navigate the complex ethical challenges they may encounter in their professional careers. Through a combination of lectures, case studies, discussions, and interactive activities, students engage in thoughtful reflection and analysis of ethical issues.

The course covers a wide range of topics, including professional codes of conduct, ethical decision-making models, social responsibility, environmental sustainability, and the impact of technology on society. Students explore real-world ethical dilemmas faced by engineers, examining the diverse perspectives, stakeholder interests, and potential consequences of different choices.

Students learn to identify, analyze, and address ethical issues through the application of ethical theories and frameworks. They develop skills in ethical reasoning, considering factors such as safety, fairness, honesty, and the public interest. The course encourages students to reflect on their own values, biases, and responsibilities as future engineers, fostering a strong sense of professionalism and integrity.
Additionally, the course emphasizes the importance of effective communication, collaboration, and leadership in ethical decision-making. Students engage in group activities, debates, and case studies to develop their teamwork skills and engage in ethical discussions with their peers.
The engineering ethics course prepares students to be ethically responsible and socially conscious engineers. By grappling with complex ethical dilemmas and engaging in critical analysis, students gain the necessary skills and mindset to make sound ethical decisions, contribute positively to society, and uphold the highest standards of integrity in their engineering practice.

Module 32

Code	Course/Module Title	ECTS	Semester
PRM306	Project Management	3	5
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	0	32	43
Description			
The module for electrical engineering project management provides an overview of project management principles, methodologies, and best practices. It covers project initiation, planning, execution, monitoring, and closure. The module emphasizes the coordination of project elements such as scope, schedule, budget, resources, and stakeholders for successful project execution. It explores the specific phases and activities involved in electrical engineering projects, including design, procurement, construction, testing, and commissioning. The module also focuses on scope management, schedule management, cost management, risk management, quality management, resource management, and communication management. It delves into techniques for defining and managing project scope, developing schedules, estimating and managing costs, identifying and managing project risks, ensuring quality deliverables, optimizing resources, and establishing effective communication channels. The module highlights the importance of project monitoring and control, including tracking progress, monitoring performance metrics, conducting project status reviews, and implementing corrective actions. Overall, it equips learners with the essential knowledge and skills to successfully manage electrical engineering projects by integrating various project elements, adhering to best practices, and effectively communicating with team members and stakeholders.			

Module 33

Code	Course/Module Title	ECTS	Semester
APR321	Antenna and Propagation	6	6
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
4	2	90	60
Description			
Students are introduced to the fundamental concepts of antennas, including radiation patterns, antenna parameters, and antenna types. They learn about basic antenna designs, such as dipole, monopole, and loop antennas. The course covers the theory and design of antenna arrays, including concepts like beamforming, array factor, and radiation pattern synthesis. Students learn how to create desired radiation patterns using antenna arrays. The course explores the behavior of electromagnetic waves in various environments, including free space, indoor, and urban scenarios. Students learn about concepts like reflection, refraction, diffraction, and multipath propagation. Students gain practical experience in designing antennas using computer-aided design (CAD) tools and simulation software. They learn how to optimize antenna performance and analyze the effects of different design parameters.			

Module 34

Code	Course/Module Title	ECTS	Semester
MPR322	Microprocessors	6	6
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
4	2	90	60
Description			
The curriculum of the microprocessor programming course aims to teach the student the basic principles of the 8086 microprocessor and how to program it. Starting with the arithmetic and logic unit and the control unit, then the small storage units and instructions and the way they are implemented inside the microprocessor, and then the input and output units. And then how to program using assembly language and using the instructions of the 8086 processor and how to use it and write integrated programs through the use of the processor board and using an emulator program (emu8086) installed on the computer. The curriculum aims to teach the student how to program the microprocessor and its components and how to benefit from it			

Module 35

Code	Course/Module Title	ECTS	Semester
COM323	Communications II	5	6
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	3	76	49
Description			
The module begins by introducing students to the basic concepts of digital communication, including sampling, quantization, source encoding, and modulation. Students will gain a solid foundation in understanding how digital data is encoded, transformed into signals suitable for transmission, and protected against channel impairments and noise. Next, students delve into various modulation techniques such as amplitude shift keying (ASK), frequency shift keying (FSK), phase shift keying (PSK), BPSK, and QAM. They will learn how to analyze the performance of these modulation schemes in terms of bit error rate (BER), signal-to-noise ratio (SNR), and bandwidth efficiency. The module also covers important topics such as channel capacity, error control coding, and multiple access techniques. Students will explore concepts like Shannon's channel capacity theorem, which establishes the theoretical limit of reliable data transmission over a noisy channel. They will also gain insights into error detection and correction codes, including block codes used to enhance the robustness of digital communication systems.			

Module 36

Code	Course/Module Title	ECTS	Semester
NAN324	Numerical Analysis	4	6
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
3	0	46	54

Description

Numerical analysis is a field of mathematics and computational science that focuses on developing algorithms and methods to solve complex mathematical problems using numerical techniques. It encompasses a wide range of topics, including the solution of nonlinear equations, numerical differentiation and integration, solving ordinary differential equations of various orders, iterative methods for linear and nonlinear systems, interpolation methods, finite difference approximations, curve fitting, numerical integration techniques, complex variable theory, solving differential equations using power series, Legendre's equation and polynomials, and properties of Bessel functions, gamma function, and beta function.

In numerical analysis, the goal is to approximate solutions to mathematical problems that are often difficult or impossible to solve analytically.

By utilizing numerical methods, researchers and practitioners can obtain accurate and efficient approximations, enabling them to analyze and understand complex systems in various scientific and engineering fields.

Numerical analysis plays a vital role in scientific computing and simulation, where mathematical models are used to study and predict real-world phenomena.

It provides techniques for solving equations, estimating derivatives and integrals, interpolating data, and fitting curves to experimental results. These methods allow researchers to make predictions, optimize designs, simulate physical processes, and analyze complex systems. The field of numerical analysis is closely connected to computer programming and algorithm design.

Efficient implementation of numerical methods requires consideration of computational complexity, accuracy, and stability. Through the development and analysis of numerical algorithms, researchers strive to improve the accuracy and efficiency of computations, ensuring reliable results in practical applications.

Overall, numerical analysis is a fundamental discipline that bridges the gap between mathematical theory and real-world problem-solving. By employing numerical techniques, students can tackle complex mathematical problems, gain insights into physical systems, and make informed decisions based on reliable numerical results.

Module 37

Code	Course/Module Title	ECTS	Semester
POW325	Fundamentals of Electrical Power	6	6
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
4	2	88	62
Description			
This Course provides an introduction to the electrical power systems. It first presents a basic-level perspective of the principles of the generation units. It then explains the transmission lines in terms of electrical and mechanical design. This course describes the core components of electrical power systems (generation, transmission and distribution). It is followed by a discussion on the concepts of power factor correction, voltage control, ac and dc distributers and economic load dispatch. This Electrical Power System Engineering course includes content that covers an overview of modern power systems, principles of reactive power and voltage control and review of single and three-phase AC networks. This program will also cover many in-class examples and problems for a hands-on learning experience. Student will be able to know the design and management of power systems, bulk electrical energy transport issues, the design and operation of electricity transmission and distribution networks. This series of lectures, introduction to Electrical power systems, focuses more on improving the basic knowledge related to student electrical power systems.			

Module 38

Code	Course/Module Title	ECTS	Semester
RMW326	Research Methodology and Academic Writing	3	6
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	0	32	43
Description			
This course covers topics such as research process, form their beginning, through formulation of the topic and final research report writing. Research Methodology will enable students to equip with fundamental knowledge on research design, quantitative and qualitative methods and will equip them with skills to use with competence application of software packages, and academic writing styles in their research thesis or similar research projects in the business related fields. More specifically, students will be able to: generate research questions, demonstrate knowledge to conduct literature review in the critical manner, evaluate the research approaches and strategies – research design, analyze quantitative and qualitative information, understand implication of ethics in their research, understand and apply sampling procedures, present and assess numerical information.			

Module 39

Code	Course/Module Title	ECTS	Semester
ESY401	Embedded Systems	4	7
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
3	0	46	54
Description			
The Embedded Systems module provides an introduction to embedded systems, focusing on their design, implementation, and programming. It covers the major application areas of embedded systems, such as automotive, consumer electronics, medical devices, and industrial automation. The module explores the design process using top-down and bottom-up approaches, including requirement definition, system specification, and hardware/software integration. The module delves into the elements of embedded systems, including processors, controllers, memory types (e.g., Flash, PROM, RAM), sensors, actuators, and other components commonly used in embedded systems. It introduces the Arduino platform, discussing its architecture and providing hands-on experience with Arduino programming. The module progresses to cover digital input/output interfacing, analog input/output interfacing, advanced sensor interfacing, and motor control using Arduino. Students engage in project development, where they apply the concepts learned in small-scale projects. Throughout the module, emphasis is placed on problem-solving, critical thinking, teamwork, and effective communication. Students gain practical skills in designing, programming, and integrating hardware and software components for embedded systems. They also develop an understanding of testing, validation, and documentation in the development process. By the end of the module, students are expected to have a solid foundation in embedded systems design, programming, and implementation. They should be capable of developing small-scale projects integrating the knowledge and skills acquired, and effectively presenting their work.			

Module 40

Code	Course/Module Title	ECTS	Semester
PSA402	Power Systems Analysis	4	7
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
3	0	46	54
Description			
This course gives the student the ability to apply knowledge of power systems analysis.The course will emphasize the development of problem-solving techniques. The Power Systems Analysis module covers a wide range of topics related to the analysis and operation of power systems. Some of the key areas covered in this module include: Per unit systems to arise from the need to compare and analyze power system components that may have different ratings, voltages, or capacities. Power Flow Analysis: This topic focuses on the analysis of power flow within a network, including the calculation of voltage magnitudes and phase angles, active and reactive power flows. Power System Protection: The module explores the principles and practices of power system protection. Fault Analysis: The module covers the study of various types of faults that can occur in power systems. Stability Analysis: This topic delves into the analysis of power system stability.			

Module 41

Code	Course/Module Title	ECTS	Semester
CNT403	Control System I	6	7
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
3	3	90	60
Description			
The Control Systems I module provides students with a comprehensive understanding of control systems engineering principles and techniques. The module introduces students to the fundamental concepts, analysis methods, and design principles related to control systems. It begins with an overview of control systems, including different types of control systems and the importance of feedback in system design. Students learn about block diagrams, signal flow graphs, and the distinction between open-loop and closed-loop control systems. Mathematical modeling techniques are a key component of the module. Students learn to represent dynamic systems using differential equations, transfer functions, and state-space models. They gain proficiency in translating real-world problems into mathematical models and understanding the relationships between system variables. This module also covers time-domain analysis, focusing on the time response of control systems. Students learn about performance metrics such as rise time, settling time, overshoot, and steady-state error. They explore methods for analyzing and improving system performance through the adjustment of control parameters. Stability analysis is another significant aspect of the module. Students learn techniques such as the Routh-Hurwitz stability criterion and root locus analysis to evaluate system stability. They understand the effects of system parameters on stability and learn how to design stable control systems.			

Module 42

Code	Course/Module Title	ECTS	Semester
PWE404	Power Electronics	6	7
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
4	2	90	60
Description			
This course discusses the fundamental concepts and introduces the essentials of analyses , design , and simulation of power electronic circuits. Topics include power electronics devices, switching losses, analyses and design of single-phase ac-dc converters, simulation of single-phase ac-dc converters, analyses and design of three-phase ac-dc converters, simulation of three-phase ac-dc converters, analyses and design of dc-dc converters, simulation of dc-dc converters, analyses and design of ac-ac converters, analyses and design of single- and three-phase dc-ac converters, simulation of single dc-ac converters, analyses and design of Maximum Power Point Tracking controller for photovoltaic system, Study Speed control of DC and AC motors.			

Module 43

Code	Course/Module Title	ECTS	Semester
DEL405	Digital Electronics	5	7
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
3	1	60	65
Description			
This Course Specification provides a concise summary of the main features of the course and the learning outcomes that a typical student might reasonably be expected to achieve and demonstrate if he/she takes full advantage of the learning opportunities that are provided. It should be cross-referenced with the programming specification, where the student starting the course with the knowledge about the types of timing circuits and 555 Timers to implement Astable , Monostable, & Bistable systems. Signals generated from these systems are demonstrated and discussed while sharing the circuit needs like ADC, DAC, Shift Registers & Counters and sequence generators with their timing and frequency analysis. This line will be followed by specifying sequential circuits in Finite Sequential Machine (FSM) design and analysis using Mealy & Moore Approaches for solving digital circuits problem analysis and design solving. the last part demonstrate the Algorithmic State Machine (ASM) applied on larger circuit specifications, responsibilities, and applications to overcome the FSM approach limitations.			

Module 44

Code	Course/Module Title	ECTS	Semester
PRJ406	Graduation Project I	5	7
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	2	58	67
Description			
The module for electrical engineering project management provides an overview of project management principles, methodologies, and best practices. It covers project initiation, planning, execution, monitoring, and closure. The module emphasizes the coordination of project elements such as scope, schedule, budget, resources, and stakeholders for successful project execution. It explores the specific phases and activities involved in electrical engineering projects, including design, procurement, construction, testing, and commissioning. The module also focuses on scope management, schedule management, cost management, risk management, quality management, resource management, and communication management. It delves into techniques for defining and managing project scope, developing schedules, estimating and managing costs, identifying and managing project risks, ensuring quality deliverables, optimizing resources, and establishing effective communication channels. The module highlights the importance of project monitoring and control, including tracking progress, monitoring performance metrics, conducting project status reviews, and implementing corrective actions. Overall, it equips learners with the essential knowledge and skills to successfully manage electrical engineering projects by integrating various project elements, adhering to best practices, and effectively communicating with team members and stakeholders.			

Module 45

Code	Course/Module Title	ECTS	Semester
DSP421	Digital Signal Processing	5	8
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
3	1	60	65
Description			
This Course Specification provides a concise summary of the main features of the course and the learning outcomes that a typical student might reasonably be expected to achieve and demonstrate if he/she takes full advantage of the learning opportunities that are provided. It should be cross-referenced with the programming specification, where the student starting the course with the knowledge about the types of systems and signals applied to these systems to demonstrate their response and stability on both time and frequency domains. This line specifies the time analysis with convolution and correlation to be changed to the frequency analysis by applying Fourier and Laplace and there field applications on filtering signals and filter specifications and designs to be followed by Z-Transform and Discrete Fourier analysis and the interaction strategy between analog and discrete signals. the last part demonstrate the special analysis with Multi-Resolution Analysis applied on Wavelet Transform which demonstrates the three dimensional signal shape and demonstration for higher resolutions			

Module 46

Code	Course/Module Title	ECTS	Semester
RSG422	Renewable Energy and Smart Grid	5	8
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	2	62	63
Description			
This course discusses the fundamental concepts and introduces the essentials of analyses, design, and simulation of Renewable Energy and Smart Grid. Topics include Renewable Energy and Smart Grid. Renewable energy storage and electric vehicles (EVs). Introduction to smart grid, Demand Side Management and Demand Response Smart Meters, Smart Grid Standards ,IT Networks and Security Elements of the power grid and measurement technologies, Introduction to Optimization. Elements of power networks and data analysis of economic drives of the smart grid. Economics of Smart Grids & Impact, Policies			

Module 47

Code	Course/Module Title	ECTS	Semester
CNT423	Control Systems II	6	8
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
3	3	90	60
Description			
The Control II module includes the design and tuning of controllers. Students learn about Proportional-Integral-Derivative (PID) controllers and design via root locus. They gain practical experience in designing (lead, lag, lead-lag) controllers that meet desired performance specifications. The frequency-domain analysis is introduced to assess the behavior of control systems in the frequency domain. Students learn about frequency response plots, such as Bode plot and Nyquist plot, to analyze gain, phase, and system stability. They also explore concepts like gain and phase margins. An introduction to state-space control is provided, covering state-space representation, controllability, and observability. Students explore state feedback techniques and learn how to achieve desired system behavior through pole placement. The module covers also discrete-time systems and z-transform, sampled-data systems, zero-order hold digital controller design techniques. Throughout the module, students engage in practical exercises, problem-solving activities, and simulations to apply the concepts learned. They develop critical thinking and analytical skills in analyzing control systems and designing solutions for real-world applications.			

Module 48

Code	Course/Module Title	ECTS	Semester
ITC424	Information Theory and Coding	4	8
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	1	46	54
Description			
The Information Theory and Coding course syllabus is organized into several parts, each addressing key aspects of the subject. Part 1 introduces students to Information Theory and Channel Coding. It covers the distinction between information theory and coding theory, explores the model and operations of information processing systems, delves into the physical interpretation and measurement of information, and discusses the properties of information. Part 2 focuses on Error Detection and Correction Codes. Students learn about error detecting and error correcting codes, including concepts like even and odd parity generators, the definition of error correcting codes, and the difference between systematic and non-systematic codes. The topics of Hamming distance, weight, bound, and the application of Hamming codes are also covered.			

Part 3 delves into Block Codes and Convolutional Codes. Students gain an understanding of linear block codes, including their encoding and decoding processes. The introduction of convolutional codes follows, along with discussions on state, trellis, and tree diagrams. The decoding of convolutional codes using the Viterbi algorithm is also explored.
Part 4 focuses on Cyclic Codes, covering their introduction, encoding of systematic cyclic codes, and the implementation of cyclic encoders and decoders.
Part 5 introduces advanced coding techniques such as Reed-Solomon codes, Turbo codes, and Low-density parity-check (LDPC) codes.
Finally, Part 6 explores Information Theory in Data Compression, including an introduction to data compression and its importance. It covers lossless data compression algorithms like Run-Length Encoding, Huffman Coding, and Arithmetic Coding, as well as Shannon's Source Coding Theorem and its implications. The section also discusses lossy data compression techniques, rate-distortion theory, and the trade-off between compression ratio and quality.
Additionally, the syllabus covers the Applications of channel Coding Techniques in various communication systems, including wireless, satellite, optical, storage, digital television, and multimedia systems.

Module 49

Code	Course/Module Title	ECTS	Semester
PRJ425	Graduation Project II	5	8
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	2	58	67
Description			

The module for electrical engineering project management provides an overview of project management principles, methodologies, and best practices. It covers project initiation, planning, execution, monitoring, and closure. The module emphasizes the coordination of project elements such as scope, schedule, budget, resources, and stakeholders for successful project execution. It explores the specific phases and activities involved in electrical engineering projects, including design, procurement, construction, testing, and commissioning. The module also focuses on scope management, schedule management, cost management, risk management, quality management, resource management, and communication management. It delves into techniques for defining and managing project scope, developing schedules, estimating and managing costs, identifying and managing project risks, ensuring quality deliverables, optimizing resources, and establishing effective communication channels. The module highlights the importance of project monitoring and control, including tracking progress, monitoring performance metrics, conducting project status reviews, and implementing corrective actions. Overall, it equips learners with the essential knowledge and skills to successfully manage electrical engineering projects by integrating various project elements, adhering to best practices, and effectively communicating with team members and stakeholders.

Module 50

Code	Course/Module Title	ECTS	Semester
AIN426	Artificial Intelligence	5	8
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	2	62	63
Description			
The syllabus for the Artificial Intelligence for Electrical Engineering course is divided into six parts. Part 1 provides an introduction to Artificial Intelligence (AI) and covers topics such as an overview of AI and its historical background. Part 2 focuses on Neural Networks and includes discussions on the basics of neural networks, the Perceptron as a fundamental building block, the expansion of Perceptron into multi-layer neural networks, and the utilization of activation functions and the backpropagation algorithm for weight adjustment. Part 3 delves into Machine Learning and Deep Learning Fundamentals, covering supervised, unsupervised, and reinforcement learning, key machine learning algorithms, training and evaluation of models, and an introduction to deep learning and deep neural networks. Part 4 introduces Optimization Techniques, including various algorithms such as gradient descent, stochastic gradient descent, and genetic algorithms, and explores their application in fine-tuning AI models. Part 5 explores Fuzzy Logic and Fuzzification, encompassing topics such as Fuzzy Logic and Fuzzy Sets, Fuzzy Rules, Fuzzification, and Defuzzification. Lastly, Part 6 delves into the Application of AI in Electrical Engineering, showcasing practical examples of AI techniques in power systems, control systems, signal processing, smart grids, renewable energy, and other relevant domains. Additionally, the syllabus includes a discussion on Future Trends in AI for Electrical Engineering, highlighting emerging trends and advancements that are shaping the future of the field.			

Contact

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الملحق رقم (4)

وصف المواد الدراسية

لقسم الهندسة الكهربائية

Module Description Forms for Electrical Engineering

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**English Language I**			**Module Delivery**	
Module Type	**Basic**			☒ **Theory** ☒ **Lecture** ☐ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**ENLA102**				
ECTS Credits	**2**				
SWL (hr/sem)	**50**				
Module Level		**UGI**	**Semester of Delivery**		1
Administering Department		Type Dept. Code	**College**	Type College Code	
Module Leader	Dr.Hussein Jumma Jabir		**e-mail**	hjjahmn@gmail.com	
Module Leader's Acad. Title		Lecturer	**Module Leader's Qualification**		Ph.D
Module Tutor			**e-mail**		
Peer Reviewer Name		Assist. Prof. Baraa Munqith AbdulJabar	**e-mail**	baraaalbaker@aliraqia.edu.iq	
Scientific Committee Approval Date		15/06/2023	**Version Number**	1.0	

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

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	1. To enable the learner to communicate effectively and appropriately in real-life situations. 2. To use English effectively for study purposes across the curriculum. 3. To develop and integrate the use of the two language skills, i.e., listening, speaking. 4. To develop interest in and appreciation of literature. 5. To revise and reinforce structures already learnt. 6. To basically translate from English to Arabic and vice versa.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	students should be able to:- 1. Read silently at varying speeds depending on the purpose of reading 2. Recognize the organization of a text. 3. Identify the main points of a text. 4. Adopt different strategies according to the purpose of listening. 5. Listen to a talk or conversation and understand the topic and main points. 6. Speak intelligibly using appropriate word stress, sentence stress and intonation patterns. 7.
Indicative Contents المحتويات الإرشادية	Indicative Contents include the following :- **<u>Part A-Grammar :-</u>** **Elementary / basic English grammar**: **Grammar** (1): verb to be, main verbs, Possessive adjectives. **Everyday English** (everyday conversation) **Grammar (2)** present simple (1), questions and negative (jobs). present simple (2) , adverb of frequency, Past simple (1), regular and irregular verbs , prepositions (1) Time expression(1)) **Everyday English** (What time it is) (Social expression) **Grammar (3)**: Demonstrative Pronouns (there is , there are , that , this ,those) How much , How many , some , a lot of , any **Everyday English** (numbers and prices) **Grammar (4)**: Model verbs (can, could, ….) Was born , . **Everyday English** (polite requests) (what's the date) (special occasions) (Expressing doubt and certainty) meaning (14 Hours) **<u>Part B –Vocabulary</u>** Vocabulary :Synonyms , Antonyms : word endings , word stress , right word , wrong word , verbs with similar meaning , adjective and noun, (Regular and Irregular verbs) , Adverbs Vocabulary (Possessive's , adjective, oppositive adjective, adverbs , words that go together (verb+noun) or (noun +noun) , Vocabulary prepositions(2) , adverb (2) , Food and drink , daily needs, jobs, describing feeling and things .(12 Hours)

	Part C: Speaking - Speaking: speaking a technical report , a seminar , Team work activities (discussion and conversation) Seminar skill (4 Hours) **Part D Translation: -** Translation a technical report from English to Arabic and from Arabic to English. Electrical engineering terms. (6 Hours)

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	❖ Lectures: In-class lectures delivered by the instructor provide the foundational knowledge and theoretical concepts of English language. Lectures can include explanations, demonstrations, and the presentation of examples to illustrate key concepts. ❖ Interactive Discussions: Encourage active participation and engagement through interactive discussions. This can involve asking questions, facilitating group discussions, and encouraging students to share their insights and perspectives on grammar and English activities . ❖ Group team work: Assign groups that require students to apply their knowledge of English language. ❖ Guest Speakers: Invite language professionals or researchers in the field of language to share their experiences and insights. Guest speakers can provide real-world perspectives, discuss emerging trends, and inspire students in their learning journey. ❖ Online Resources and Multimedia: Provide access to online resources, textbooks, lecture recordings, and interactive multimedia materials that support the learning of English language. These resources can serve as supplementary materials for self-study and reinforce understanding. ❖ Formative and Summative Assessments: Incorporate a variety of assessment methods, including quizzes, assignments, lab reports, and examinations, to evaluate students' understanding and progress. Provide constructive feedback to help students improve their knowledge and skills in English language.

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	4
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	18	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	2.6
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**	3	15% (15)	7, 12	LO #1-5
	Assignments	3	15% (15)	4, 10	All
	Report	1	10% (10)	12	All
Summative assessment	**Midterm Exam**	1 hr	10% (10)	7	LO # 1-3
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

Week	Material Covered
Week 1	**Grammer (1)** - tenses (present , past , future) , question , questions word , **Everyday English** (social expression)
Week 2	**Grammer (2)** :Present tenses(present simple , present continuous (have and have got) **Everyday English** (Making conversation)
Week 3	**Grammer(3)** Past tenses (past simple , past continuous) **Vocabulary** (Regular and Irregular verbs) , Adverbs **Everyday English** (Saying when)
Week 4	**Grammer (4):** Quantity , articles **Everyday English** (Can you came for dinner , Requests)
Week 5	**Grammer (5) :** Verbs patterns , future forms **Vocabulary** : Phrasal verb (literal , Idiomatic) **Everyday English** (Expressing doubt and certainty)
Week 6	**Grammer**(6) : Comparative and superlative adjective **Everyday English** : What's on
Week 7	**Grammer(7)** : Present perfect , Indefinite past , ever and never **Everyday English** :Agree with me go together , prepositions , word with two meaning **+Mid exam**

Week 8	**Vocabulary** :Synonyms , Antonyms : word endings , word stress , right word , wrong word , verbs with similar meaning , adjective and noun
Week 9	
Week 10	**Speaking**: speaking a technical report , a seminar , **Team work activities** (discussion and conversation) **Seminar skills**
Week 11	
Week 12	**Translation:** a technical report from English to Arabic and from Arabic to English. Electrical engineering terms.
Week 13	
Week 14	
Week 15	**Preparatory week before the final Exam**
Week 16	**Final Exam**

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	**New Headway Oxford Elementary, Pre-intermediate, and Intermediate**	Yes
Recommended Texts		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	**Physical Electronics**			**Module Delivery**	
Module Type	**Basic**			☒ **Theory** ☐ **Lecture** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**PHY102**				
ECTS Credits	**6**				
SWL (hr/sem)	**150**				
Module Level		**UGI**	**Semester of Delivery**		1
Administering Department		Type Dept. Code	**College**	Type College Code	
Module Leader	Anas F. Ahmed		**e-mail**	anasfuad33eng@yahoo.com	
Module Leader's Acad. Title		Assist. Professor	**Module Leader's Qualification**		Ms.c.
Module Tutor			**e-mail**	E-mail	
Peer Reviewer Name		Dr. Ali Kadim Hantoosh	**e-mail**	alialmousoi2006@yahoo.com	
Scientific Committee Approval Date		15/06/2023	**Version Number**		1.0

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

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	1. To understand the concepts of atomic structure, the dual nature of matter, energy levels, quantum numbers, and crystal structure. 2. To understand The ability to analyze electronic ballistics. 3. To develop problem solving skills and understanding electron mobility, explain conduction in metals, semiconductor types, and the Fermi energy level. 4. Introducing the basic principles of the diode, its types, structure and properties, analyzing its circuits, and studying its most important applications in electronic circuits. 5. Introducing the basic principles of the BJT transistor, its structure and characteristics, analyzing its basic circuits, and studying its most important applications in electronic circuits.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	On completion of this module students are expected to: 1. Understand and be able to apply physical electronic concepts. 2. Describe the characteristics of a diode, and its use in electronic circuits. 3. Describe the characteristics of a BJT, and its use in electronic circuits.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. Introduction to atomic structure, The atom, wave nature of light, Bohr's model collision of electron with atom, dual nature of matter, Quantum numbers, energy-band theory of metals insulators and semiconductors, crystal structure Covalent bonding energy band of crystals and energy levels, Electron ballistics Electrical conduction in metals, The mobility, The conductivity Energy distribution of electrons, Fermi level, Semiconductor materials Silicon, germanium, extrinsic semiconductor Compensated semiconductor, Fermi level in semiconductor [28 hrs] Semiconductor Doping, PN junction, diode depletion width, LED, Resistance level of the diode, diode equivalent circuits Full-wave rectifier, Diode clipper circuits Diode clippers summary circuits with different AC inputs waveform, Zener Region Zener diode voltage regulator circuits, Other types of diodes and review questions Introduction to the BJT transistor structure, BJT common base, common emitter, common collector BJT DC biasing Circuits. [24 hrs] Examinations. [8 hrs]

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

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	88	**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	4.3
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)	Continuous	LO #1, 2, and 3
	Assignments	2	10% (10)	Continuous	LO #1, 2, and 3
	Projects	1	10% (10)	Continuous	All
	Report	1	10% (10)	Continuous	All
Summative assessment	**Midterm Exam**	1 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 to atomic structure, The atom, wave nature of light, Bohr's model
Week 2	collision of electron with atom, dual nature of matter, Quantum numbers, energy-band theory of metals
Week 3	insulators and semiconductors, crystal structure Covalent bonding
Week 4	energy band of crystals and energy levels, Electron ballistics
Week 5	Electrical conduction in metals, The mobility, The conductivity
Week 6	Energy distribution of electrons, Fermi level, Semiconductor materials Silicon, germanium, extrinsic semiconductor
Week 7	Compensated semiconductor, Fermi level in semiconductor + Midterm Exam
Week 8	Semiconductor Doping, PN junction, diode depletion width, LED, Resistance level of the diode, diode equivalent circuits
Week 9	Full-wave rectifier, Diode clipper circuits
Week 10	Diode clippers summary circuits with different AC inputs waveform, Zener Region
Week 11	Zener diode voltage regulator circuits, Special types of diodes and review questions
Week 12	Introduction to the BJT transistor structure, BJT common base, common emitter, common collector
Week 13	BJT DC biasing Circuits
Week 14	
Week 15	Preparatory week before the final Exam
Week 16	final Exam

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Donald A. Neamen, "Semiconductor Physics and Devices: Basic Principles," McGraw-Hill International Edition, Fourth Edition, 2012	No
	Boylestad, Robert L., and Louis Nashelsky. "Electronic Devices and Circuit Theory 11th ed." (2018).	Yes
Recommended Texts	B.L. Theraja, "Basic Electronics: Solid State," S. Chand & Company Ltd, 2005.	No

	Floyd, Thomas L. Electronic devices (electron flow version). Prentice-Hall, Inc., 2007.	
Websites	https://site.unibo.it/semiconductor-physics/en	

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 I**			**Module Delivery**	
Module Type	**Basic**			☒ **Theory** ☐ **Lecture** ☐ **Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**MAT103**				
ECTS Credits	**6**				
SWL (hr/sem)	**150**				
Module Level		UGI	**Semester of Delivery**		1
Administering Department		Type Dept. Code	**College**	Type College Code	
Module Leader	Qasim Hadi Kareem		**e-mail**	Qasim.hadi2017@gmail.com	
Module Leader's Acad. Title		Lecturer	**Module Leader's Qualification**		Ph.D.
Module Tutor	Qasim Hadi Kareem		**e-mail**	Qasim.hadi2017@gmail.com	
Peer Reviewer Name		Dr Farqad Talib	**e-mail**	farqad_alani@yahoo.com	
Scientific Committee Approval Date		15/06/2023	**Version Number**		1.0

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

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	1. Understanding the Fundamentals: The primary aim of the Calculus I module in engineering is to provide students with a solid foundation in the fundamental concepts and principles of calculus. This includes understanding the basic concepts of limits, derivatives, and integrals, and their applications in engineering problems. 2. Developing Analytical Skills: Another important aim of the module is to develop students' analytical skills. By studying calculus, students learn how to analyze and solve problems using mathematical techniques such as differentiation and integration. These skills are crucial for engineering students as they encounter various mathematical models and equations in their future coursework and professional practice. 3. Applying Calculus to Engineering Problems: The module aims to enable students to apply calculus to engineering problems. Through real-world examples and engineering applications, students learn how to model and solve problems involving rates of change, optimization, and approximation. This helps them develop the ability to translate physical and engineering problems into mathematical expressions and utilize calculus techniques to find solutions. 4. Enhancing Problem-Solving Abilities: Calculus I aims to enhance students' problem-solving abilities. By working on a variety of calculus problems, students develop critical thinking skills and gain experience in formulating strategies to solve complex problems. They learn to break down problems into manageable steps, analyze the given information, and apply appropriate calculus techniques to reach accurate solutions. 5. Building a Solid Mathematical Foundation: Finally, the module aims to provide engineering students with a solid mathematical foundation that will serve as a basis for more advanced courses in their degree program. Calculus is a prerequisite for many higher-level engineering courses, and a strong understanding of its concepts is essential for success in those courses. By mastering the topics covered in Calculus I, students are better prepared for the rigorous mathematical challenges they will encounter throughout their engineering education.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Solve the matrix equation using elementary matrix operations. 2. Solve systems of linear equations and matrix equations to determine linear dependency or independency. 3. Demonstrate how quadratic equations lead to complex numbers. To write complex numbers in polar form, compute exponential and integrals powers of complex numbers.

	4. Evaluate the limit of a function at a point or at infinity numerically by using L'Hospital's Rule. 5. Compute limits, derivatives, and indefinite integrals of algebraic, logarithmic and exponential functions, 6. Evaluate partial derivatives and can implement to estimate maxima and minima of multivariable function. 7. Determine the continuity and differentiability of a function at a point and on a set. 8. Use the derivative of a function to determine the properties of the graph of the function and use the graph of a function to estimate its derivative; 9. To find area of the region bounded by curves and to find volume and surface area of solid geometric figures. 10. Evaluate integrals of functions by different integral techniques such as trigonometric substitution and partial fractions. The learning outcomes of Calculus I will set students up for success in their future academic and professional endeavors.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. 1. Introduction to Calculus: Real numbers and number systems. Functions and their properties. Notation and terminology used in calculus. The concept of limits and its applications. Intuitive understanding of the derivative and the integral. 2. Differentiation: Definition and basic properties of derivatives. Rules for differentiation: power rule, product rule, quotient rule, chain rule. Applications of derivatives: rates of change, optimization, tangents and normals, curve sketching. 3. Integration: Antiderivatives and indefinite integrals. Definite integrals and their properties. Fundamental Theorem of Calculus. Techniques of integration: substitution, integration by parts. Applications of integration: area under curves, volumes of revolution. 4. Transcendental Functions: Exponential and logarithmic functions and their properties. Trigonometric functions and their derivatives. Inverse trigonometric functions and their derivatives.

	Applications of transcendental functions in calculus.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Learning and Teaching Strategies are: 1. Active Learning: Incorporating active learning strategies encourages students to actively engage with the course material. This can involve problem-solving exercises, group discussions, hands-on activities, and interactive demonstrations. By actively participating in their learning, students develop a deeper understanding of the concepts and enhance their problem-solving skills. 2. Conceptual Understanding: Emphasize the importance of conceptual understanding rather than rote memorization. Encourage students to grasp the underlying principles and ideas of calculus, rather than simply memorizing formulas. Use visual aids, real-world examples, and analogies to help students connect abstract mathematical concepts with tangible applications in engineering. 3. Practical Applications: Integrate real-world engineering applications throughout the course. Relate the concepts of calculus to engineering problems, systems, and designs. Show how calculus is used in various engineering disciplines, such as mechanics, electrical circuits, fluid dynamics, and control systems. Demonstrating the relevance of calculus in engineering motivates students and helps them appreciate its practical significance. 4. Problem-Based Learning: Design problem-based learning activities that require students to apply calculus concepts to solve engineering problems. Provide them with authentic, challenging problems that simulate real-world scenarios. Encourage students to analyze the given information, formulate appropriate strategies, and work collaboratively to find solutions. This approach fosters critical thinking, decision-making, and problem-solving skills. 5. Technology Integration: Utilize technology tools, such as graphing calculators, computer algebra systems, and mathematical software, to enhance learning and teaching. These tools can assist students in visualizing concepts, exploring mathematical relationships, and verifying their solutions. Use software packages specifically designed for engineering applications to further reinforce the connections between calculus and engineering disciplines. 6. Assessment Strategies: Employ a variety of assessment methods to evaluate students' understanding and progress. This can include traditional examinations, quizzes, projects, and problem-solving assignments. Incorporate both theoretical questions and practical applications to assess students' ability to apply calculus concepts in engineering contexts. Provide timely feedback to students to guide their learning and address any misconceptions.

	7. Collaborative Learning: Encourage collaboration among students by incorporating group activities, discussions, and projects. Working together on calculus problems promotes peer-to-peer learning, allows students to learn from each other's perspectives, and fosters communication and teamwork skills. Collaborative learning also mirrors real-world engineering practices, where teamwork and collaboration are essential. 8. Office Hours and Support: Provide opportunities for individualized support and guidance through office hours, tutorials, or online discussion forums. This allows students to seek clarification on challenging topics, receive personalized feedback, and address their specific concerns. Creating a supportive learning environment helps students build confidence in their understanding of calculus concepts.

Student Workload (SWL)

الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	88	**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	4.3
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)	1, 2	LO #1 , 2 and 3
	Assignments	2	10% (10)	3-8	LO # 3, 4 and 5
	Projects / Lab.	1	10% (10)	Continuous	All
	Report	1	10% (10)	9, 10	All
Summative assessment	Midterm Exam	1 hr	10% (10)	9	LO # 1-7
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus): Mathematics I المنهاج الاسبوعي النظري لمادة الرياضيات 1	
	Material Covered
Week 1	Matrices and Determinants, Complex numbers
Week 2	Polar Coordinates
Week 3	Inequalities, absolute value, function, domain, and range
Week 4	Even and odd function, symmetry, Combining functions, composition functions
Week 5	Shifting graphs, trigonometric functions
Week 6	Trigonometric graphs and identities
Week 7	Limits, limit at infinity
Week 8	Differentiation, Application of Differentiation, Max. and Min. of Function
Week 9	Integration, Application of definite integral, Area between two curves + Midterm Exam
Week 10	Inverse functions, Logarithms, The exponential function
Week 11	Integration Techniques: Trigonometric substitutions and Integration involving ax^2+bx+c
Week 12	Integration Techniques: integration by parts, power of sine and cosine
Week 13	Integration Techniques: integration by partial fractions
Week 14	L'Hôpital's rule
Week 15	Preparatory week before the final Exam
Week 16	Final Exam

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	"Thomas Calculus" G. Thomas, M. Weir, et al., 14th edition, 2017.	Yes
Recommended Texts	"Engineering Mathematics", by John Bird, 8th edition, Elsevier Ltd., 2017.	No
Websites	http://www.electronics-tutorials.ws/combination	

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	**DCC104**				
ECTS Credits	**6**				
SWL (hr/sem)	**150**				
Module Level		UGI	**Semester of Delivery**		1
Administering Department		Type Dept. Code	**College**	Type College Code	
Module Leader	Dr. Alaa Hussein ABDULAAL		**e-mail**	Engineeralaahussein@gmail.com	
Module Leader's Acad. Title		Lec	**Module Leader's Qualification**		Ph.D.
Module Tutor	Dr. Alaa Hussein ABDULAAL		**e-mail**	Engineeralaahussein@gmail.com	
Peer Reviewer Name		Dr. Firas Ali Jawad Al-Hasani	**e-mail**	firasissa75@gmail.com	
Scientific Committee Approval Date		15/06/2023	**Version Number**		1.0

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

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	1. To develop problem solving skills and understanding of circuit theory through the application of techniques. 2. To understand voltage, current and power from a given circuit. 3. This course deals with the basic concept of electrical circuits. 4. To understand Ohm's Law 5. To understand Kirchhoff's current and voltage Laws problems. 6. To perform mesh and Nodal analysis. 7. To perform Thévenin theorem Norton theorem and maximum power transfer theorem 8. To develop problem solving skills and understanding Superposition theorem , Millman's theorem, substitution theorem, reciprocity theorem , Source Transformation
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Recognize how electricity works in electrical circuits. 2. List the various terms associated with electrical circuits. 3. Summarize what is meant by a basic electric circuit. 4. Describe electrical power, charge, and current. 5. Define Ohm's law. 6. Identify the basic circuit elements and their applications. 7. Explain the two Kirchoff's laws used in circuit analysis. 8. Understanding Superposition theorem , Millman's theorem, substitution theorem, reciprocity theorem , Source Transformation 9. Discuss the various properties of resistors, capacitors, and inductors.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. <u>Part A - Circuit Theory</u> DC circuits – Current and voltage definitions, Passive sign convention and circuit elements, Combining resistive elements in series and parallel. Kirchhoff's laws and Ohm's law, Network reduction, Introduction to mesh and nodal analysis. <u>Part B -</u> Fundamentals Resistive networks, voltage and current sources, Thevenin and Norton equivalent circuits, current and voltage division, input resistance, output resistance, , maximum power transfer

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	90	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4 .1
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	60	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	4.2
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	150		

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

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Basic concepts , systems of units , Charge , Current , current density, Voltage and Efficiency
Week 2	Circuit Elements , Types of sources**:** independent and dependent voltage sources and their transformation, new and renewable energy sources
Week 3	Ohm's Law ,temperature effect, Nodes, Branches, and Loops
Week 4	Equivalent resistance: series, parallel, (series-parallel), delta and star connections
Week 5	
Week 6	Kirchhoff's Laws, Circuit Analysis
Week 7	Nodal Analysis
Week 8	Mesh Analysis
Week 9	**Mid-term Exam**
Week 10	Introduction to network theorems : Thévenin theorem Norton theorem , maximum power transfer theorem
Week 11	
Week 12	Superposition theorem , Millman's theorem, substitution theorem, reciprocity theorem , Source Transformation
Week 13	
Week 14	Capacitors and Inductors in DC Circuits
Week 15	**Preparatory week before the final Exam**
Week 16	**Final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Basic Information and Ohm's law.
Week 2	
Week 3	Series and parallel circuits
Week 4	
Week 5	Voltage and current divider
Week 6	
Week 7	Delta-Star concession
Week 8	
Week 9	Methods of Analysis :Mesh Analysis and Nodal Analysis
Week 10	
Week 11	circuit Theorems : Thevenin Theorem , Superposition Theorem and Norton's Theorem
Week 12	
Week 13	Maximum power Transfer
Week 14	

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Fundamentals of Electric Circuits, C.K. Alexander and M.N.O Sadiku, McGraw-Hill Education	Yes
Recommended Texts	DC Electrical Circuit Analysis: A Practical Approach Copyright Year: 2020, dissidents.	Yes
Websites	https://www.coursera.org/browse/physical-science-and-engineering/electrical-engineering	

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

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

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

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Computer**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☐ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**COMP105**				
ECTS Credits	**6**				
SWL (hr/sem)	**150**				
Module Level		1	**Semester of Delivery**		1
Administering Department		College of Engineering	**College**	College of Engineering	
Module Leader	Asst. Prof. Dr. Rasha Subhi Ali		**e-mail**	rasha.s.ali@aliraqia.edu.iq	
Module Leader's Acad. Title		Asst. Prof.	**Module Leader's Qualification**		Ph.D.
Module Tutor	Name (if available)		**e-mail**	E-mail	
Peer Reviewer Name		RAGDA ABD UL RAB	**e-mail**	E-mail	
Scientific Committee Approval Date		05/09/2024	**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 Aims أهداف المادة الدراسية	This course introduces first-year Electrical Engineering students to the foundational principles of computer science. It includes an overview of computer components, algorithms, and flowcharts, and provides practical training in Microsoft Word and Excel. The course culminates with instruction in the C++ programming language to prepare students for future technical applications.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Identify major hardware components of computers. 2. Understand and apply algorithmic problem-solving methods and flowcharts. 3. Demonstrate proficiency in Microsoft Word and Excel for academic report writing. 4. Define and apply C++ data types and syntax. 5. Write and debug simple C++ programs. 6. Utilize mathematical functions in problem-solving. 7. Create and manipulate arrays and functions in C++. 8. Solve programming problems using structured and logical approaches. 9. Understand and apply control structures in programming. 10. Develop a solid foundation in programming applicable to future engineering work. In summary, this course includes the learning of basic concepts for computer science, algorithms, flow charts, and C++ programming language
Indicative Contents المحتويات الإرشادية	Indicative content includes the following: **Part A –** • Computer basics • Algorithms and flowcharts • Introduction to C++ **Part B –** • C++ programming fundamentals • Operators, loops, functions, arrays • String and mathematical functions

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Strategies: 1. Daily and monthly exams. 2. Quarterly and final exams. 3. Participation scores for competition questions for academic subjects. 4. Grades for homework. 5. Providing students with the basics and additional topics related to the pre-skills education outcomes to solve practical problems. 6. Solve a set of practical examples by the academic staff. 7. Students participate during the lecture by solving some practical problems. 8. The scientific laboratories of the department are monitored by the academic staff.

	9. Forming panel discussions to discuss topics related to computer programming that require analysis and thinking. 10. Giving students homework. 11. Asking students a set of thinking questions related to programming in the C++ language.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	90	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	6
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	60	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	5
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	150		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	2	10% (10)	5 and 10	LO #1, #2 and #10, #11
	Assignments	2	10% (10)	2 and 12	LO #3, #4 and #6, #7
	Projects / Lab.	1	10% (10)	Continuous	All
	Report	1	5% (10)	13	LO #5, #8 and #10
Summative assessment	**Midterm Exam**	2hr	15% (10)	7	LO #1 - #7
	Final Exam	4hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Introduction to computer, hardware and IT
Week 2	Types of computers and networks
Week 3	Cpu, Memory and I/O
Week 4	Buses + Bios + Storage
Week 5	computer languages ,flowchart, and algorithms
Week 6	Definition of C++ languages, Data types of C++
Week 7	Mid term exam C++ operators
Week 8	Program control in C++ (if statement and **Switch-Case Statement)**
Week 9	Logical operators
Week 10	Program control loops in C++ (For loops and do - while Loop statements)
Week 11	Some loop functions (jump, go to , infinite loop)
Week 12	Mathematical and String Functions in C++
Week 13	**Arrays one dimensional array and Two Dimensional array**
Week 14	**Functions**
Week 15	**Solving advanced problems**
Week 16	**Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Learn basic concepts of how to use computer (opening and shut downing computer , creating, delete ,move, and copy files)
Week 2	Basic concepts in Microsoft word (creating new Ms word, writing on it, change color and font (type and size))
Week 3	Experiments in adding new or existing equation , and adding shapes, tables and images in Ms word

Week 4	Basic concepts in Excel (creating new Excel file , creating tables, charts on it and adding functions))
Week 5	Drawing flow charts in ms word
Week 6	Simple program in C++
Week 7	Mid Exam Operator Experiments
Week 8	If and select-case Experiments
Week 9	logical + bitwise Experiments
Week 10	While and For Loop Experiments
Week 11	jump, go to , infinite loop Experiments
Week 12	Mathematical and String Functions in C++ Experiments
Week 13	Array Experiments
Week 14	Functions Experiments

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.

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	1. Introduction to Computers By Gordon B. Davis " Introduction to electronic computers: Davis, Gordon B.: 9780070158214: Amazon.com: Books" 2. Borland C++ Builder By Herbert Schmidt " Borland C++ Builder: The Complete Reference - Schildt, Herbert; Guntle, Gregory L.: 9780072127782 - AbeBooks" 3. C / C++ Programmers References By Herbert Schmidt " Amazon.com: C/C++ Programmer's Reference: 9780072127065: Herbert Schildt: Books"	
Recommended text	*C++ How to Program* (10th Edition) by Paul & Harvey Deitel Amazon.com: C++ How to Program (10th Edition): 9789332585737: Paul J. Deitel, Harvey M. Deitel: Books Modern C++ for Absolute Beginners: A Friendly Introduction to C++ Programming Language and C++11 to C++20 Standards Slobodan Dmitrović Belgrade, Serbia ISBN-13 (pbk): 978-1-4842-6046-3 https://link.springer.com/book/10.1007/978-1-4842-6047-0 Problem Solving with C++ TENTH EDITION Walter Savitch Problem Solving with C++ Tenth Edition Global Edition C++ Primer / Stanley B. Lippman, Josée Lajoie file:///F|/WinDDK/resources/CPPPrimer/c++primer.htm (metu.edu.tr) C++ By Dissection By Ira Pohl C++ by Dissection (bobzhang.dscloud.me)	

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Workshop**			**Module Delivery**	
Module Type	**Basic**			☐ **Theory** ☐ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**WSP106**				
ECTS Credits	**2**				
SWL (hr/sem)	**50**				
Module Level		**UGI**	**Semester of Delivery**		1
Administering Department		Type Dept. Code	**College**	Type College Code	
Module Leader	Mazin Nabih Ali		**e-mail**	Mazinnabih@gmail.com	
Module Leader's Acad. Title		Assistant Lecture	**Module Leader's Qualification**		master
Module Tutor	Nil		**e-mail**	Nil	
Peer Reviewer Name		Dr. Baraa Munqith AbdulJabar	**e-mail**	baraaalbaker@aliraqia.edu.iq	
Scientific Committee Approval Date		15/06/2023	**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	A. Introduce students the basics of electrical and electronic devices, tools and circuits. B. Introduce students the basics of joining; welding and soldering processes. C. Introduce students to the basics of the electrical device and circuits with improving the skills that deal with methods of measurement and standardization. D. Introduce students to the basics of transformers, types and design. E. Introduce students to the basics of capacitors include the charging and dis charging circuits and the methods of test. F. Introduce students to the industrial electrical and skill of using tools and design of electrical circuits and control panels. G. Introduce students to the basics of the welding arts and installation of metal and the types of welding machines and skills to deal with the kinds of welding and measurement methods and standardization. H. Developing student skills in welding and soldering operations. I. Making students dealing with the problem and damage circuits to repair and fix it.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1- Acquire knowledge and understanding 2- Preparation of practical engineers in the field of electrical, network and computer engineering who are characterizing by a high level of knowledge and technological innovation, and work in with internationally approved discreet standards of quality assurance and academic accreditation of corresponding engineering programs with a commitment to ethics of engineering career. 3- Learn and understand risk factors surrounding it enabled. 4- Learn and understand some of the theoretical principles. 5- To be able subject-specific skills 6- To be able discussion and dialogue. 7- Brain storming by encouraging students to produce a large number of ideas about some issue or problem raised during the job. 8- Self-learning by teaching the student by his own according to his special abilities and mental and cognitive levels responding to his preferences and interests to achieve development and integration of his capabilities. 9- Cooperative learning by team working.
Indicative Contents المحتويات الإرشادية	**Indicative content includes the following.** Occupational Safety and importance ;(1 week) Tools and Devices; (1 week) Test methods; (1 week) Design and supply; (2 week) Welding and soldering processes; (2 weeks) Transformers and rectification circuits; (4 weeks) Capacitors and charging and discharging circuits; (3 weeks) Mini projects ; (1 weeks)

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	No two days are the same and what might have worked once in a classroom, might not work again. Switching between teaching strategies to suit the needs of the learners is a great way to ensure that the learners are meaningfully engaged and actively participating in the classroom. 1- Visualization is very simply put, the ability to create mental images based on the words we hear or the text that we read. Some of the methods of implementing this strategy in the classroom include: - Use of audio visual aids like photos, videos, audio clips, songs etc - Diagrams, charts and mind maps - Modeling as you teach for the visual learners who might need to see a visual representation to understand as opposed to hearing the concept being explained. 2- Virtual learning has led educators to understand the importance of a key part of the learning process – cooperation. 3- Cooperative learning is an instructional strategy in which a small group of students collaboratively work on a given task. The task can be as simple as solving a quiz or as complex as writing a story.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	30	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	20	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	1.3
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, #3 and #5, #6
	Assignments	2	10% (10)	2 and 12	LO #4 and #7
	Projects / Lab.	1	10% (10)	Continuous	All
	Report	1	10% (10)	13	LO #2 and #8
Summative	**Midterm Exam**	1hr	10% (10)	7	LO #1 - #8

assessment	**Final Exam**	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للورشة	
	Material Covered
Week 1	Introduction to the basics of occupational Safety and importance and understanding the rules of Electrical Safety Principles.
Week 2	Understand how to use tools and devices
Week 3	Understanding the principles of resistors and ohms law and design circuits and how to use AVO meter
Week 4	Understand resisters coding and how to check the resistors
Week 5	Understanding the principles of capacitors and the methods of test. Design charging and dis-charging circuits.
Week 6	Design parallel and series electrical circuits
Week 7	Understanding the principles of transformer and the methods of test + Midterm exam
Week 8	Design and testing diode, LED diode, and zener diode
Week 9	Design and test the rectification circuits
Week 10	Clipper circuits
Week 11	Welding processes: practical exercises
Week 12	Soldering processes: practical exercises
Week 13	Practical work experiments
Week 14	Design small mini projects such as design a mini power supply
Week 15	Preparatory week before the final Exam
Week 16	Final Exam

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Technical workshop (Materials & Devices) authored by Mazin N. Ali, 2016. Electrical & Electronics Engineering, Amrita School of Engineering, 2014	yes

	Electronics Workshop Lab Manual, Polytechnic, Bilaspur, 2010	
Recommended Texts	Engineering Workshop Data. A Book of Reference containing Data, Formulae, Tables, hints and Recipes relating to all Phases of Engineering Workshop Practice. Hardcover – 1 Jan. 1947.	No
Websites	https://www.slideshare.net/JosephKonnully/workshop-practise	

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

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

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	Human rights and democracy			**Module Delivery**	
Module Type	**Support**			☐ **Theory** ☒ **Lecture** ☐ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	HRAD103				
ECTS Credits	**2**				
SWL (hr/sem)	**50**				
Module Level		**UGII**	**Semester of Delivery**		1
Administering Department		Type Dept. Code	**College**	Type College Code	
Module Leader	Asmaa falih jassm		**e-mail**	asmaafalih2@gmail.com	
Module Leader's Acad. Title		assistant Lecturer	**Module Leader's Qualification**		MSc
Module Tutor	Name (if available)		**e-mail**	E-mail	
Peer Reviewer Name		Dr.Anwar Qutaiba Yahya	**e-mail**	83dr.anwar@gmail.com	
Scientific Committee Approval Date		15/06/2023	**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 ـ تعريف الطلاب بحقوق الإنسان وواجباته تجاه الفرد والمجتمع .** **2 ـ تشجيع الطالب على دراسة حقوق الإنسان مما يساهم في تنمية مهارات تفكيره حول حقوق الإنسان وحريته، ويطلعه على جانبها المشرق .** **3 ـ تعريف الطالب بكيفية التعامل مع المعاهدات الدولية والإقليمية وتشريعاتها الداخلية واشتقاق المعرفة .المتعلقة بتلك الحقوق وكيفية انعكاسها ودورها الحقيقي والحضاري في حياة الشعوب .** **4 ـ تمكين الطلبة من الحصول على معرفة بالدستور والسلطات التشريعية والقضائية .**
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	**1 ـ دراسة نظريات حقوق الإنسان والديمقراطية .** **2 ـ إيضاح المراحل التاريخية لحقوق الإنسان وتطورها .** **3 ـ إيضاح أهم الحقوق والواجبات الممنوحة للفرد المكفولة دستورياً والتي تساهم في تغيير حياته للافضل .** **4 ـ نشر فكرة العدالة الاجتماعية لجميع الأفراد دون تمييز على أساس الدين أو العرق أو اللون .** **5 ـ تأكيد ورفع روح المواطنة ، وتعزيز فكرة الانتماء إلى الأرض والوطن ، والالتزام بالقوانين والأنظمة .** **6 ـ تعزيز مهارة التفكير لدى الطالب وخلق ثقته أثناء الحوار حول حقوق الإنسان** **7 ـ تعريفه بطريقة وآلية التعامل الحقيقي بين المجتمع الدولي والمحلي مع حقوق الإنسان** **8 ـ تنمية المعرفة المتعلقة بحقوق الإنسان وكيفية انعكاسها ودورها الحضاري الحقيقي في حياة الشعوب**
Indicative Contents المحتويات الإرشادية	**ارشاد الطلبة لمعرفة التأصيل لمصطلح حقوق الإنسان ومفهومه وعرض بعض آراء العلماء العرب والأجانب حوله .** **ارشاد الطلبة وتعريفهم بالإعلان الفرنسي والاعلان العالمي لحقوق الإنسان والمواطن .** **ارشاد الطلبة لبيان التطور التاريخي لفكرة حقوق الإنسان التي نبدأها بحقوق الإنسان في حضارة بلاد ما بين النهرين وتوضيح بنية النظام الاجتماعي في حضارة بلاد ما بين النهرين.** **ارشادج الطلبة حول سلبيات ظاهرة الفساد الاداري وانعكاساتها على حقوق الانسان للفرد والمجتمع وسبل مكافحتها وحماية الفرد والمجتمع منها .** **ارشاد الطلبة الى أنواع الحقوق والحريات العامة ألاساسية والفكرية والسياسية والتي تكفل ان يحيا حياة حرة كريمة .** **ارشاد الطلبة الى مفهوم الديمقراطية وتعريفها وبيان أنواعها .**

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	

1 ـ إلقاء محاضرات نظرية بطريقة تفاعلية بين الأستاذ والطالب بشكل مباشر . 2 ـ استخدام أسلوب المناقشة المباشرة وطرح الأسئلة وفتح الحوار وعرض تجارب الدول في هذا المجال . 3 ـ إعطاء الطلاب مساحة لإدارة جزء من وقت المحاضرة لتحسين وتوسيع مهارات التفكير النقدي في نفس الوقت الذي يتم فيه تطبيق حق من حقوق الإنسان في عرض الرأي والدفاع عنه دون التعرض لآراء الآخرين. 4 ـ تكليف الطلاب بإعداد التقارير و البحوث و عمل لوحات إعلانية حول موضوع حقوق الإنسان .	

Student Workload (SWL)

الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا

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

Module Evaluation

تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	2	20% (20)	5 and 10	LO #1, #2 and #10, #11
	Assignments	2	10% (10)	2 and 12	LO #3, #4 and #6, #7
	Report	1	10% (10)	13	LO #5, #8 and #10
Summative assessment	**Midterm Exam**	1hr	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	**معنى الحق في اللغة العربية ومفهوم حقوق الإنسان**
Week 2	**تعريف حقوق الإنسان والإعلان العالمي لحقوق الإنسان**

Week 3	**حكمة الله تعالى على حقوق الإنسان والإعلان الفرنسي لحقوق الإنسان والمواطن**
Week 4	**حقوق الإنسان في حضارة بلاد ما بين النهرين**
Week 5	**النظام الاجتماعي في حضارة بلاد ما بين النهرين**
Week 6	**الإعلان العالمي لحقوق الإنسان**
Week 7	**ظاهرة الفساد الإداري وتداعياتها وحلولها الناجحة لمكافحة الفساد الإداري وحماية المجتمع منه+ امتحان نصف الفصل الدراسي**
Week 8	
Week 9	**الحقوق والحريات الأساسية: الحق في الحياة والحق في الكرامة والحرية والسلامة الشخصية**
Week 10	**الحق في الخصوصية وحرية الإقامة والتنقل والحق في الجنسية**
Week 11	**الحقوق والحريات الفكرية: حرية المعتقد والدين ، وحرية الرأي والتعبير ، والحق في التجمع والتجمع ، والحق في عدم التجمع**
Week 12	**.حرية الصحافة وحرية الإذاعة والتلفزيون والسينما والمسرح وحرية التعليم والحق في تكوين الجمعيات والأحزاب السياسية**
Week 13	**الحقوق السياسية: الحق في المساواة والانتخاب**
Week 14	**مفهوم الديمقراطية وتعريفها و أنواع الديمقراطية**
Week 15	**أسبوع تحضيري قبل الامتحان النهائي**
Week 16	**الاختبارات النهائية**

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Human rights between text and application , Dr. Ali Shukri	Yes
Recommended Texts	Human rights , Dr. Maher Allawi	No
Websites	https://www.coursera.org/browse/physical-science-and-engineering/electrical-engineering	

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

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

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Mathematics II**			**Module Delivery**	
Module Type	**Basic**			☒ **Theory** ☐ **Lecture** ☐ **Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**MAT121**				
ECTS Credits	**7**				
SWL (hr/sem)	**175**				
Module Level		UGI	**Semester of Delivery**		2
Administering Department		Type Dept. Code	**College**	Type College Code	
Module Leader	Shaima'a B. Yass		**e-mail**	E-mail	
Module Leader's Acad. Title		Assist. lecturer	**Module Leader's Qualification**		Master
Module Tutor	Name (if available)		**e-mail**	E-mail	
Peer Reviewer Name		Dr. Farqad Talib	**e-mail**	farqad_alani@yahoo.com	
Scientific Committee Approval Date		15/06/2023	**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 apply concepts of vector algebra to statics. 2. To find the line of intersection of two planes(of a line and a plane) 3. Partial derivatives are useful in analyzing surfaces for maximum and minimum points and give rise to partial differential equations in next stage. 4. To find the instantaneous rate of z change in any direction at a point by directional derivative. 5. State the requirements for a series to converge to a limit 6. Describe a periodic signal in terms of cosine and sine waves 7. Understand their engineering application
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Perform basic operations on vectors including: addition, subtraction, and scalar multiplication 2. Finding the vector, standard, and general forms of the equations of a line and of a plane 3. teaching students how to find the slope and equation of the tangent 4. To evaluate partial derivatives and can implement to estimate maxima and minima of multivariable function 5. To understand the applications of partial differentiation 6. Determine the equation of a plane tangent to a given surface at a point 7. To impart the knowledge of sequences and summation of series 8. Able to differentiate power series to obtain new ways to represent functions as power series. 9. To find the Fourier series representation of a function of one variable and to find half-range Fourier series for even/odd functions
Indicative Contents المحتويات الإرشادية	• Vectors Vector geometry in R^2 and R^3 vector properties and manipulation. Unit vectors, position vectors, Cartesian coordinates. Scalar product and vector product. • partial derivatives The definition of partial derivatives, their formulas, partial derivative rules such as chain rule, with application. • Series Series as sequences of partial sums. Summation of series and sigma notation • power series power series is a special type of infinite series representing a mathematical function in the form of an infinite series that either converges or diverges • Fourier series Series expansions. Definition of Fourier series. Related expansions.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	1- Giving theoretical lectures 2- Solve many problems 3- Using illustration methods such as drawing 4- Direct discussion by asking questions and opening dialogue and interaction with students. 5- Giving video lecture if need

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	87	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	88	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	4.3
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	20% (20)	Continuous	All
	Assignments	2	10% (10)	Continuous	All
	Report	1	10% (10)	13	LO #8
Summative assessment	**Midterm Exam**	1hr	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	Vectors: introduction to vectors, vector representation, vector operation, dot product, cross product, triple product,
Week 2	equation of line and planes in space, intersection planes,
Week 3	vector functions and their derivatives, curvature
Week 4	unit normal vector, binomial vector, torsion,
Week 5	Tangent and normal component
Week 6	Partial derivatives: first order partial derivatives, Higher order partial derivatives
Week 7	Chain rule, wave equation, Laplace equation, total differential+ Midterm Exam
Week 8	Maxima, minima, and saddle points: case 1, case 2, max and min with constrains
Week 9	substitution method and Lagrange multiplier
Week 10	Gradients, directional derivative and tangent planes
Week 11	Gradients, directional derivative and tangent planes
Week 12	Sequence and infinite series: power series
Week 13	Sequence and infinite series: power series.
Week 14	Fourier series
Week 15	Preparatory week before the final Exam
Week 16	**Final Exam**

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Calculus By Thomas	Yes
Recommended Texts	Advanced engineering mathematics by E.Kreyszig	Yes
Websites		

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

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

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

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Engineering drawing**			**Module Delivery**	
Module Type	Support			☐ **Theory** ☐ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**EDR122**				
ECTS Credits	**2**				
SWL (hr/sem)	**50**				
Module Level		**UGI**	**Semester of Delivery**		2
Administering Department		Type Dept. Code	**College**	Type College Code	
Module Leader	Dr.Mohammed Ghazi Abbas		**e-mail**	mohammed.ghazi@aliraqia.edu.iq	
Module Leader's Acad. Title		lecture	**Module Leader's Qualification**		Ph.D.
Module Tutor	Name (if available)		**e-mail**	E-mail	
Peer Reviewer Name		Dr. Omar Hassan Hameed	**e-mail**	Eng.ohh.2014@gmail.com	
Scientific Committee Approval Date		15/06/2023	**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 aim of this module is to provide students with a comprehensive understanding of engineering drawing principles and techniques. It aims to develop their skills in creating and interpreting technical drawings, which are essential in the field of engineering. The module also aims to enhance students' spatial visualization abilities and their understanding of the relationship between 2D representations and 3D objects. 2. Describing the AutoCAD program and its icons, knowing what's new in AutoCAD version. 3. The students will have skills to use that's program and drawing any things (2D). 4. Reading plans of projects. 5. How to make show for them projects. 6. Auto desk AutoCAD software provide powerful ,integrated 2D modeling, drawing ,and layers tools that enable designers to focus more energy on creative ,rather than technical challenges
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Demonstrate an understanding of the principles and conventions of engineering drawing. 2. Apply appropriate techniques to create accurate and precise engineering drawings. 3. Interpret and analyze technical drawings, including dimensions and annotations. 4. Learn drawing skills by AutoCAD. 5. Learn to read construction plans by AutoCAD. 6. Increase the student's imagination by AutoCAD.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. 1. <u>Introduction to Engineering Drawing</u> Importance of engineering drawing in the design and manufacturing process. Standards and conventions in engineering drawing. Types of technical drawings: orthographic projections, isometric projections, etc. 2. <u>Drawing Instruments and Techniques</u> Overview of drawing instruments and their uses Sketching techniques and line types Scaling, dimensioning, and labeling 3. <u>Orthographic Projections</u> Principles of orthographic projection Multi-view drawings Sectional views and conventions

	4. Isometric Projections Introduction to isometric projections Isometric drawing techniques and isometric scales Isometric views of objects and assemblies Extracting 2D Drawings form Isometric drawing. 5. Creating and Modifying Components by AutoCAD. 6. Modeling and Modifying Elements by AutoCAD.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	In this module, a combination of project-based learning, lectures, and group discussions will be utilized to create an engaging learning environment. Students will apply engineering drawing principles and techniques to real-world scenarios, participate in interactive lectures using visual aids and examples, collaborate in group discussions to analyze and problem-solve, engage in practical exercises and workshops to develop technical drawing skills with traditional tools and CAD software, and conduct independent study.

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	2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	32	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	2.7
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**	12	15% (15)	Continuous	All
	Assignments	12	20% (20)	Continuous	All
	Projects / Lab.	3	5% (5)	12,13 and 14	

Summative assessment	**Midterm Exam**	1hr	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	Principle of engineering drawing
Week 2	Sketching techniques and line types & Scaling, dimensioning, and labeling
Week 3	Principles of orthographic projection
Week 4	Multi-view drawings in orthographic projection
Week 5	Sectional views and conventions
Week 6	Introduction to isometric projections
Week 7	Isometric drawing techniques and isometric scales
Week 8	Isometric views of objects and assemblies Extracting 2D Drawings form Isometric drawing+ **Mid**
Week 9	**exam**
Week 10	1- Introduction - Theory lectures on history of AutoCAD program, what's new versions, how to install program. 2- Explanation the main window for program, how to arrange it before start work.
Week 11	Use file icon from the window (open, new, save, save as, export, merge, drawing properties .draw orders (line and construction line with types of lines (hidden and center lines)) and modify (erase, move, copy) Orthogonally, snaps, grid, scale and explode.
Week 12	Draw Arcs, polyline, circles and rectangle Draw Ellipses, trim and extend orders, rotate and mirror.
Week 13	Term Exam + tutorial. And Application of previous orders. Layer order (how to change color, name, type and thickness of line by layer)
Week 14	Explanation of construction and architectural plans and types of lines (showing examples) and Application of previous orders.
Week 15	**Preparatory week before the final Exam**
Week 16	**Final Exam**

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	1-Manual of engineering drawing - Simmons C.H., Maguire D. E. 2-Autodesk AutoCAD 2021: Learn CAD With Ease (For Beginners) Hardcover – February 20, 2021 by Madhumita Kshirsagar.	no
Recommended Texts	1-Giesecke, Frederick Ernest, et al. Technical drawing with engineering graphics. Vol. 15. Prentice Hall, 2016. 2-French, Thomas Ewing, and Charles J. Vierck. The fundamentals of engineering drawing and graphic technology. McGraw-Hill Companies, 1978.	yes
Websites	https://www.autodesk.com/	

Grading Scheme
مخطط الدرجات

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

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

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**AC Electrical Circuits**			**Module Delivery**	
Module Type	**Core**			☒**Theory** ☐**Lecture** ☒**Lab** ☒**Tutorial** ☐**Practical** ☐**Seminar**	
Module Code	**ACC123**				
ECTS Credits	**6**				
SWL (hr/sem)	**150**				
Module Level		**UGI**	**Semester of Delivery**		1
Administering Department		Type Dept. Code	**College**	Type College Code	
Module Leader	Alaa Majeed		**e-mail**	Alaamajeed1984@gmail.com	
Module Leader's Acad. Title		Asst.Lec	**Module Leader's Qualification**		MSc
Module Tutor	Name (if available)		**e-mail**	E-mail	
Peer Reviewer Name		Dr.Firas Ali Jawad	**e-mail**	firasissa75@gmail.com	
Scientific Committee Approval Date		15/06/2023	**Version Number**	1.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	DCC104	**Semester**	1
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 the basic principles of alternating current circuits and the student must be able to know the meaning of AC current, voltage and impedance and determine the physical meaning of the vocabulary of this subject like, Frequency, Cycle, Radian angle, Reactance, etc. 2. Calculations of currents, voltages and electrical power for AC circuits. 3. Knowledge of electric circuit elements (inductor and capacitor) 4. To make the student able to deal with sinusoidal varying quantities mathematically in order to analyze AC circuits, he must understand the phasor relationship with these quantities. 5. The idea of the power factor must be well discussed for the student to make his belief in it, and then the power factor correction means will be understandable as well. 6. The same network circuit theorems for DC circuits applied to AC circuits by taking into consideration the complex number representation of AC quantities. This step must be associated with a lot number of practice exercises in order to raise the ability of the students in AC circuit mathematical manipulations. 7. The students must know well the physical meaning of the types of power in AC circuits. Then the idea of the maximum power transfer must be dealt with the real power only. 8. Analysis of three phase circuits and compare with the single phase circuits.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Understanding the main principles of A.C. Electricity. 2. Analysis of electric A.C. circuits and Comprehension of the main theories related to the course. 3. Development of experience in the analysis of A.C. electric circuits 4. Ability to absorb the engineering unit values in time and phaser domain. 5. Ability to use mathematics to represent input impedance for electrical circuits. 6. Ability to use complex representation of sinusoidal varying quantities such as Voltage and Current and Understanding the mathematical interpretation of engineering problems 7. Ability to use mathematics to represent poly phase electrical circuits. 8. The physical meaning of AC power must be well comprehended by students, as well as the power triangle. The student will be able to deal with their mathematical representation. 9. The student learn the idea of poly phase circuits and compare with the single phase circuits, The student know the positive and negative sequence. Also power calculations using wattmeters method

Indicative Contents المحتويات الإرشادية	Indicative content includes the following. Part A - AC circuits – Sinusoids and Phasors, Phasor Relationships for Circuit Elements, Kirchhoff's Laws in the Frequency Domain, Sinusoidal Steady-State Analysis Part B - AC Power Analysis , Effective Value, Apparent Power , Power Factor, Complex Power, Three-Phase Circuits, Balanced and Unbalanced Three-Phase Voltages. analysis of Y-Y circuits, analysis of Y-Δ circuits, analysis of Δ-Δ circuits, analysis of Δ-Y circuits, power calculations.

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	90	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	6
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	60	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	4
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	150		

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

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Generation of single-phase voltage, waveforms - instantaneous value and real value, relation between time and angle, max - average and R.M.S values of alternating and sinusoidal voltage and current, form factor and peak factor. Frequency and period of a sinusoidal waveform.
Week 2	Phasor Relationships for AC Circuit Elements, voltage and current relations in pure resistive inductive and capacitive circuits.
Week 3	Analysis of single-phase AC circuit, Impedance and Admittance, Phasor diagram and notation.
Week 4	Series , parallel, and series / parallel circuits, phasor diagram, delta and star connections(Impedance Combinations).
Week 5	Kirchhoff 's law: KVL-KCL in the Frequency Domain.
Week 6	Nodal analysis, Maxwell 's circulating currents (mesh analysis).
Week 7	Superposition Theorem , Source Transformation

Week 8	Thevenin and Norton Equivalent Circuits
Week 9	Instantaneous and Average Power, Maximum Average Power Transfer **+Mid-term Exam**
Week 10	Effective or RMS Value, Complex Power , Conservation of AC Power ,Power Factor Correction.
Week 11	Power calculations, power factor, power factor correction, average power, apparent power, complex power. Phasor diagram.
Week 12	Balanced three-phase system, positive phase sequence source, negative phase sequence source, Balanced Wye-Wye Connection, Balanced Wye-Delta Connection power calculations.
Week 13	Balanced Delta-Delta Connection , Balanced Delta-Wye Connection Power in a Balanced System
Week 14	Unbalanced three phase system analysis, phasor diagram, power calculations.
Week 15	**Preparatory week before the final Exam**
Week 16	**Final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	AC Series Circuits Capacitive and Inductive Reactance.
Week 2	
Week 3	Resistor and Inductor in Series
Week 4	
Week 5	Resistor and Capacitor in Series
Week 6	
Week 7	Resistor, Inductor and Capacitor parallel
Week 8	
Week 9	Series - parallel Resistor, Inductor and Capacitor circuits.
Week 10	
Week 11	AC Superposition Theorem

Week 12	
Week 13	Frequency measurements.
Week 14	

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Fundamentals of Electric Circuits, C.K. Alexander and M.N.O Sadiku, McGraw-Hill Education	Yes
Recommended Texts	Boylistad , "Introductory Circuit Analysis", 10th Edition	Yes
Websites	https://www.coursera.org/browse/physical-science-and-engineering/electrical-engineering	

Grading Scheme
مخطط الدرجات

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

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

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Principles of Mechanical Engineering**			**Module Delivery**	
Module Type	**Support**			☒ **Theory** ☐ **Lecture** ☐ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**MEC124**				
ECTS Credits	**5**				
SWL (hr/sem)	**125**				
Module Level		**UGI**	**Semester of Delivery**		2
Administering Department		Type Dept. Code	**College**		Type College Code
Module Leader	Ruaa Muthana Ali		**e-mail**		ruaaalmusa@gmail.com
Module Leader's Acad. Title		Lecturer	**Module Leader's Qualification**		Ph.D.
Module Tutor	Name (if available)		**e-mail**		E-mail
Peer Reviewer Name		Dr. Omar Hassan Hameed	**e-mail**		Eng.ohh.2014@gmail.com
Scientific Committee Approval Date		15/06/2023	**Version Number**		1.0

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

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	1. This course deals with the basic concept of static and dynamic mechanics 2. To develop problem solving skills and understanding the concepts of forces, resultant forces and momentum. 3. To understand friction, centroid and moment of Inertia. 4. To solve Newton's and thermodynamics Laws problems. 5. To know heat transfer conduction mechanism for different shapes.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Compute the force, moment & their application through solving of simple problems on coplanar forces. 2. Understand the concept of equilibrium of rigid bodies. 3. Know the existence of friction & its applications through solution of problems. 4. Calculate the moment of inertia by integration method and center of gravity by moments. 5. Analyze frictional force, and classify the friction into static, dynamic & limiting friction. 6. Know how to analysis of trusses for coplanar system. 7. Know the types of acceleration component and rectilinear motion, curvilinear motion and rectangular components of curvilinear motion. 8. Apply and understand the second law of Newton through solution of problems. 9. Understand the principles of work and energy. 10. Explain the zeroth and second law of thermodynamics and its applications. 11. Apply the concept of second law of thermodynamics through carnot cycle 12. Demonstrate Heat transfer mechanism in one dimension conduction for a Plane Wall, Cylinder and Sphere.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. <u>FUNDAMENTALS OF ENGINEERING MECHANICS</u> Force - force system, units of force, effect of force, and characteristics of a force, principle of physical independence of forces, system of forces. Moment of a force - moment of a force about an axis types of moments - clockwise moment, anticlockwise moment, positive moment and negative moment. <u>EQUILLIBRIUM</u> Definition, principles of equilibrium, analytical conditions of equilibrium of a co-planar system of concurrent forces, analytical conditions of equilibrium of a system of coplanar non-concurrent forces, types of equilibrium - stable equilibrium, unstable equilibrium, neutral equilibrium. <u>FRICTION</u>

	Frictional force, static, dynamic & limiting friction, normal reaction, angle of repose, coefficient of friction, laws of static friction, laws of kinetic or dynamic friction. Equilibrium of bodies on level plane, equilibrium of a body on a rough horizontal plane, equilibrium of a body on a rough inclined. CENTROID AND MOMENT OF INERTIA Centroid – Introduction, Centre of gravity (C.G), centroid definition, methods for center of gravity, center of gravity by moments, axis of reference, center of gravity of plane figures. Moment of inertia - Introduction, calculation of moment of inertia by integration method, theorem of perpendicular axis, theorem of parallel axis. Kinematics and kinetics, principles of dynamics- Newton's laws of motion. Motion of particle acted upon by a constant force, equations of motion. Work, power, energy - potential energy, kinetic energy. THERMODYNAMICS Thermodynamic system, types of boundaries, types of systems, temperature and the zeroth, law of thermodynamics, the first law of thermodynamics, energy balance for closed systems equilibrium, the reversible process, irreversible process, changes of phase of matter of pure substance. SECOND LAW OF THERMODYNAMICS AND CARNOT CYCLE Statements of the second law, heat engine, the carnot cycle (carnot engine) HEAT TRANSFER Basics of heat transfer, engineering heat transfer, forms of the heat, heat transfer mechanism, conduction heat transfer one dimension conduction heat transfer, engineering heat transfer, heat conduction equation in a long cylinder, heat conduction equation in a sphere

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	60	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	3
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	65	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	3.6
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**	5	15% (15)	Continuous	All
	Assignments	3	15% (15)	6, 12	LO # 3, 4, 6 and 7
	Report	1	10% (10)	13	All
Summative assessment	**Midterm Exam**	1 hr	10% (10)	8	LO # 1-8
	Final Exam	3hr	50% (50)	15	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Fundamentals of Engineering Mechanics, units' system
Week 2	Forces and Force Systems, Resultant of Forces
Week 3	Moment of a force, Equilibrium
Week 4	Coplanar system, analysis of trusses
Week 5	Centroid & Moment of Inertia
Week 6	Friction
Week 7	Kinetics of particle, rectilinear motion, curvilinear motion.
Week 8	Rectangular components of curvilinear motion **+ Mid-term Exam**
Week 9	Normal and tangential component of acceleration
Week 10	Force, mass and acceleration, Newton’s 2'nd law.

Week 11	Work and energy
Week 12	Thermodynamic system, Zeroth and First Law of Thermodynamics
Week 13	Second law of thermodynamics and Carnot cycle
Week 14	Heat transfer mechanism, One dimension conduction heat transfer in Plane Walls, Cylinders and Spheres.
Week 15	**Preparatory week before the final Exam**
Week 16	**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	E-Learning Material Engineering Mechanics by SRI SOUMYA RANJAN MISHRA	-
Recommended Texts	Engineering Machines – Basudev Bhattacharya (Oxford University Press).	-
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 Techniques**			**Module Delivery**	
Module Type	**Core**			☒**Theory** ☐**Lecture** ☒**Lab** ☐**Tutorial** ☐**Practical** ☐**Seminar**	
Module Code	**DTC125**				
ECTS Credits	**8**				
SWL (hr/sem)	**200**				
Module Level		**UGI**	**Semester of Delivery**		2
Administering Department		Type Dept. Code	**College**	Type College Code	
Module Leader	Qasim Hadi Kareem		**e-mail**	Qasim.hadi2017@gmail.com	
Module Leader's Acad. Title		Lecturer	**Module Leader's Qualification**		Ph.D.
Module Tutor	Name (if available)		**e-mail**	E-mail	
Peer Reviewer Name		Dr.Hussein Jumma Jabir	**e-mail**	Hjjahmn@gmail.com	
Scientific Committee Approval Date		15/06/2023	**Version Number**	1.0	

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

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	1. Understanding Digital Systems: The primary aim of the Digital Techniques module is to provide students with a solid understanding of digital systems. This includes introducing the concepts of digital signals, binary representation, and digital logic gates. 2. Familiarity with Logic Circuits: The module aims to familiarize students with the fundamental components of logic circuits. Students will learn about various logic gates, such as AND, OR, NOT, NAND, and NOR gates, and how these gates can be combined to create more complex circuits. 3. Digital Circuit Analysis: The module aims to develop students' skills in analyzing and evaluating digital circuits. Students will learn techniques for simplifying and optimizing digital circuits using Boolean algebra and Boolean logic. 4. Introduction to Combinational and Sequential Logic: The module aims to introduce students to combinational and sequential logic circuits. They will learn about combinational logic circuits that generate outputs solely based on the current input values, as well as sequential logic circuits that utilize feedback to store and process information. 5. Practical Design and Implementation: The module aims to provide students with practical design and implementation skills related to digital techniques and logic circuits. Students will have opportunities to apply their knowledge by designing and implementing digital circuits using computer-aided design (CAD) tools or hardware components.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Demonstrate a clear understanding of digital systems, including the basics of digital signals, binary representation, and the concepts of high and low logic levels. 2. Acquire a comprehensive knowledge of logic gates and their characteristics. They will understand the behavior of basic logic gates such as AND, OR, NOT, NAND, and NOR, and be able to analyze and design circuits using these gates. 3. Develop the skills to design and analyze digital logic circuits. They will learn how to combine logic gates to create more complex circuits and understand the concepts of truth tables, Boolean algebra, and Boolean expressions. 4. Employ Karnaugh map for digital system optimization.

	5. Demonstrate the combinational logic circuits, which produce output solely based on the current input values. They will be able to design and analyze combinational logic circuits, including multiplexers, decoders, and encoders. 6. Gain knowledge of sequential logic circuits, which utilize memory elements and feedback to store and process information. They will understand the behavior of flip-flops, registers, and counters. 7. Implement the digital circuits and calculate input - output relationship in digital systems. 8. Analyze the sequential circuits like Registers and Counters using flip-flops.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. 1. Introduction to Digital Systems: Basics of digital signals and binary representation. Comparison of analog and digital systems. Digital logic levels: high and low states. Introduction to Boolean algebra and logic gates. 2. Logic Gates and Boolean Algebra: Detailed study of logic gates: AND, OR, NOT, NAND, and NOR. Boolean algebra: laws and theorems. Simplification of Boolean expressions using algebraic methods. De Morgan's theorem and its applications. 3. Combinational Logic Circuits: Design and analysis of combinational logic circuits. Multiplexers and demultiplexers. Decoders and encoders. Arithmetic circuits: adders, subtractors, and comparators. 4. Sequential Logic Circuits: Flip-flops: SR, JK, D, and T flip-flops. Design and analysis of synchronous and asynchronous sequential circuits. Registers and counters. 5. State diagrams and state tables.

	Logic Circuit Analysis and Optimization: Truth tables and Boolean expressions. Karnaugh maps and simplification techniques.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	1. Lectures: Conduct interactive lectures to introduce and explain the fundamental concepts, theories, and principles of each topic. Use visual aids, examples, and demonstrations to enhance understanding and engagement. 2. Hands-on Laboratory Work: Provide hands-on laboratory sessions where students can apply the theoretical concepts learned in lectures. Design experiments that allow students to build and analyze digital circuits 3. Group Projects: Assign group projects that require students to design and build practical electronic systems 4. Case Studies: Present real-world case studies where students can analyze and evaluate existing electronic systems, circuits, or devices. Discuss the challenges faced, design considerations, and performance trade-offs. 5. Online Resources: Provide access to online resources, such as textbooks, research papers, video tutorials, and interactive learning platforms, to supplement classroom learning and facilitate self-study. 6. Assessments: Conduct regular quizzes, assignments, and exams to assess students' understanding and progress. Include both theoretical and practical components to evaluate their knowledge and application skills. 7. Feedback and Discussions: Provide timely feedback on assignments and assessments, and encourage students to engage in discussions, asking questions, and seeking clarification on concepts that may be challenging.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	118	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	8
Unstructured SWL (h/sem)	82	**Unstructured SWL (h/w)**	5.5

الحمل الدراسي غير المنتظم للطالب خلال الفصل		الحمل الدراسي غير المنتظم للطالب أسبوعيا	
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	200		

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

Delivery Plan (Weekly Syllabus): Digital Techniques المنهاج الاسبوعي النظري لمادة التقنيات الرقمية	
	Material Covered
Week 1	Introduction to digital techniques and number systems (binary, octal, decimal and hexadecimal numbers)
Week 2	Number base conversions: Arithmetic operation in different number complements, binary codes, BCD, Ex-3, and gray codes
Week 3	Boolean algebra: basic definition, basic theorem and properties, Boolean functions
Week 4	Canonical standard form and logic gates
Week 5	Karnaugh maps: AND and OR implementation, don't care cases
Week 6	Adder arithmetic operations: Half and full adders, half and full subtractors, and binary parallel adders

Week 7	Code conversion: even and odd parity logic, decoder, encoder, Comparator, multiplexer, and demultiplexer
Week 8	Code conversion: even and odd parity logic, decoder, encoder, Comparator, multiplexer, and demultiplexer
Week 9	Sequential circuits: Introduction to sequential circuits, basic flip-flops, flip-flops excitation table, converting of flip-flops, and analysis of clocked sequential circuits.
Week 10	Sequential circuits: Introduction to sequential circuits, basic flip-flops, flip-flops excitation table, converting of flip-flops, and analysis of clocked sequential circuits.
Week 11	Counters: Asynchronous Counter and synchronous Counter operation
Week 12	Design of synchronous counter and properties of synchronous Counter
Week 13	Registers: Shift registers and Bidirectional Universal shift register
Week 14	Shift register counters: Ring counter and Johnson Counter.
Week 15	Preparatory week before the final Exam
Week 16	Final Exam

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Introduction to digital trainer
Week 2	Introduction to digital trainer
Week 3	Implementation the digital circuits
Week 4	Combinational Logic circuits
Week 5	Basic Arithmetic operations: Half Adder, Full Adder, and Subtractor
Week 6	Encoder and Decoder
Week 7	BCD-to-7 segment Decoder
Week 8	Multiplexers and De-multiplexers

Week 9	
Week 10	Sequential circuits: SR-Latch
Week 11	Flip-Flop: Dual JK Flip-Flop
Week 12	Flip-Flop Conversion
Week 13	Flip-Flop Conversion
Week 14	Asynchronous Counter

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	M. MORRIS MANO / MICHAEL D. CILETTI "DIGITAL DESIGN"5 th Edition 2012	Yes
Recommended Texts	Fundamentals of logic design, 6th edition, Roth, 2010, Thomson learning, Inc.	No
Websites	http://www.electronics-tutorials.ws/combination	

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	Arabic Language I			**Module Delivery**	
Module Type	Support			☒ **Theory** ☐ **Lecture** ☐ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	ARLA101				
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	Dr.Anwar Qutaiba Yahya		**e-mail**	E-mail : 83dr.anwar@gmail.com	
Module Leader's Acad. Title		Lecturer Dr.	**Module Leader's Qualification**		Ph.D.
Module Tutor	Name (if available)		**e-mail**	E-mail : anwar.q.yahya@aliraqia.edu.iq	
Peer Reviewer Name		Ass.lec. Asmaa falih jassm	**e-mail**	E-mail : asmaafalih2@gmail.com	
Scientific Committee Approval Date		15/06/2023	**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- تعد اللغة العربية وسيلة للتواصل فهي تحمل رسالة بين المتكلمين ،ولكي تكون هذه الرسالة واضحة ومفهومة يجب ان يكون ترتيب مفرداتها حسب التركيب القواعدي لتلك اللغة . ومن هنا برزت وبشكل جلي ضرورة تدريس القواعد أو النحو في كل اللغات 2- تعرف الطالب على مهارات الكتابية والتعبير والوقوف على مواطن الخطأ لتصويب النطق الصحيح 3- إتقان مهارة الكتابة الصحيحة بمعرفة قواعد الإملاء ولاسيما مواضع الاخطاء الشائعة 4- الحفاظ على اللغة العربية كونها لغة القرآن الكريم 5- التعريف بالمبادئ الاساسية للغة العربية من خلال تنمية المهارات الكتابية والتعبير والمحادثة
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1-اكتساب الطالب معرفة المفاهيم الاساسية للغة العربية وتطبيقها من خلال الأمثلة 2-معرفة كتابة الكلام الصوتي بشكل مضبوط من حيث الاصوات الصحيحة أو المعتلة 3-دراسة الطالب موضوع العدد ومعرفة كيفية كتابة بالشكل الصحيح 4-يمكن الطالب ايجاد الحلول المناسبة الصحيحة للمشاكل الحقيقية المعقدة تنمية الحس الفكري من خلال أعطاء أمثلة للغة العربية وتطبيقها 5- تكليف الطلبة بكتابة البحوث والتقارير لاختبار مدى استيعابهم للقواعد الأساسية للغة العربية وتطبيقها في حياتهم اليومية
Indicative Contents المحتويات الإرشادية	1- ارشاد الطلبة إلى تكوين خزين معرفي من أنظمة اللغة وأحكامها وقواعدها الاساسية 2-ارشاد الطلبة إلى اكتساب مهارات اللغة الاساسية والتدرب عليها من خلال التطبيق العملي كتابة ونطقا 3-ارشاد الطلبة الى الاطلاع على النصوص من الشعر والنثر بمختلف العصور ومحاكاتها في كتابة النصوص التي تعبر عن حياتهم اليومية ومشاعرهم وعواطفهم الذاتية 4-ارشاد الطلبة إلى ما يؤدي الى تعزيز مهاراتهم والانتقال به الى مستوى التفكير العالي 5-ارشاد الطلبة من خلال تعبير عن افكارهم من خلال تكوين مجموعات والتنافس بينهم

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	1-افضل طريقة في تعليم الطلبة النحو العربي لاهميته في تعلم هذه اللغة واهميته في الترجمة، هي اتباع مبدأ التعاون في التعلم . على ان يتعاون الطلاب في تهيأة مادة الدرس وتقديمها بعد تقسيمهم الى مجاميع تهتم كل مجموعة بجانب مادة الدرس . 2-القاء المحاضرات النظرية بشكل افتراضي مباشرة على السبورة 3-عمل بحوث وتوزيعها على مجاميع طلابية لمعرفة فهمهم للمادة او ادراكهم لها 4-ان الطريقة الاستقرائية باستنباط القاعدة من الامثلة تعد ناجحة في تدريس النحو 5-اهم طرائق التعلم والتعليم هي استراتيجية مهارات التفكير ضمن مجموعة 6- استراتيجية التفكير الناقد في التعلم ، ايضا من اهم طرائقه العصف الذهني

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	32	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	18	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	3
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**	3	15% (15)	5, 10, 13	LO #1, 2, 10 ,11and 12
	Assignments	3	15% (15)	2, 12, 14	LO # 3, 4, 6 and 7
	Report	1	10% (10)	11	LO # 5, 8 and 10
Summative assessment	**Midterm Exam**	1 hr	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	مقدمة عن علامات الترقيم والتعرف على أنواعها
Week 2	كتابة أنواع الهمزة (همزة القطعوالوصل ، همزة المتوسطة ، همزة المتطرفة)
Week 3	مكملات ضوابط الكتابة (التنوين ،والشدة ، المدة) والتعرف على أنواع الأخطاء اللغوية
Week 4	موضوع العدد وطريقة كتابته
Week 5	الخط العربي وأنواعه
Week 6	المشتقات (اسم الفاعل ، اسم المفعول ، اسما الزمان والمكان ، اسم الآلة)
Week 7	الفعل وأنواعه
Week 8	الفاعل والمفعول به
Week 9	أنواع المفاعيل

	امتحان مد
Week 10	المبتدأ والخبر
Week 11	المثنى والجمع وأنواعه
Week 12	الفرق بين التاء والهاء
Week 13	التذكير والتأنيث وأنواعها
Week 14	المعلقات
Week 15	مراجعة للطلاب قبل الامتحان النهائي
Week 16	الاختبارات النهائية

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	الوجيز في اللغة العربية ، محي هلال سرحان ، شرح قطر الندى وبل الصدى،لابن هشام الانصاري ، الاجرومية ابي عبدالله محمد الصنهاجي الاملاء والترقيم في الكتابة العربية ،عبد العليم ابراهيم ، اللغة العربية لغير المختصين ،مصطفى جطل وصلاح كزارة	Yes
Recommended Texts	جامع الدروس العربية ، مصطفى الغيلاني ،معاني النحو ، فاضل السامرائي دراسة في قواعد الاملاء د.عبد الجواد الطيب ، موسوعة الشامل في الكتابة والاملاء ،موسى حسن الهديب	Yes
Websites	1. https://shamela.ws/ 2. https://waqfeya.net/	

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 III**			**Module Delivery**	
Module Type	**Basic**			☒ **Theory** ☐ **Lecture** ☐ **Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**MAT201**				
ECTS Credits	**5**				
SWL (hr/sem)	**125**				
Module Level		UGII	**Semester of Delivery**		3
Administering Department		Type Dept. Code	**College**	Type College Code	
Module Leader	Assist.lec. Shaima'a B. Yass		**e-mail**	shai.bader8@gmail.com	
Module Leader's Acad. Title		Msc.	**Module Leader's Qualification**		
Module Tutor	Assist.lec. Shaima'a B. Yass		**e-mail**	shai.bader8@gmail.com	
Peer Reviewer Name		Dr. Farqad Talib	**e-mail**	farqad_alani@yahoo.com	
Scientific Committee Approval Date		15/06/2023	**Version Number**	1.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	MAT103	**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. Apply the knowledge of first order ordinary differential. 2. Recognize homogeneous and nonhomogeneous linear differential equations. 3. Determine the characteristic equation of a homogeneous linear equation. 4. Use the roots of the characteristic equation to find the solution to a homogeneous linear equation. 5. Solve initial-value and boundary-value problems involving linear differential equations 6. Applications of multiple integrals arise whenever an area or a volume under a 2D curve (a surface) needs to be measured 7. Enable the students to study the Laplace Transforms, properties of Laplace Transform 8. Apply the knowledge of inverse Laplace Transform and some applications to solve the differential equations 9. Understand their engineering application
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. To understand the formation of Differential equation from the given problems and to solve first order ordinary differential equation by various methods 2. Write the general solution to a nonhomogeneous differential equation. 3. Solve a nonhomogeneous differential equation by the method of undetermined coefficients. 4. Solve a nonhomogeneous differential equation by the method of variation of parameters 5. The major applications of multiple integrals in engineering is the determination of properties of plane 6. Setting up triple integrals for a solid region (domain) 7. Find the Laplace transform of a function, is widely used by engineers to solve quickly differential equations 8. Find Inverse Laplace transform of a function using definition. 9. Find the Laplace transform of derivatives, integrals and periodic functions.
Indicative Contents المحتويات الإرشادية	• Differential Equations First order ordinary differential equations by (a) separation, (b) Homogenous, (c) exact and (d) integrating factor. Second order ordinary differential equations with constant coefficients and right- hand sides. • Multiple Integral Define the integral of a continuous function of two variables ƒ(x, y) over a bounded region R in the plane, Then the triple integral of ƒ (x,y,z) on the region D. Applications of multiple integrals as area or a volume. • Laplace transform 1- Definition of Laplace transform and its inverse 2- Properties · Linearity · Time Delay · First Derivative · Second Derivative · Nth

	order Derivative · Integration · Convolution 3- Use Laplace transform tables to solve initial value problems for ordinary differential equations

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	1- Giving theoretical lectures 2- Solve many problems 3- Using illustration methods such as drawing 4- Direct discussion by asking questions and opening dialogue and interaction with students. 5- Giving video lecture if need

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	60	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	65	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	4.3
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**125**		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	2	20% (20)	Continuous	All
	Assignments	2	10% (10)	Continuous	All
	Report	1	10% (10)	15	LO #7
Summative assessment	**Midterm Exam**	1hr	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	Ordinary Deferential Equation (O.D.E)
Week 2	First Order (O D.E)
Week 3	1. Variable Separable, 2. Homogenous
Week 4	3. Linear , 4. Exact
Week 5	Higher Order (O.D.E), 1. 2nd Order Homogenous
Week 6	
Week 7	2. 2nd Order non- Homogenous + Mid-term Exam
Week 8	Multiple Integral 1. Double Integral
Week 9	2. Triple Integral
Week 10	3. Application of Multiple Integral
Week 11	İntroduction to Laplace Transform
Week 12	1. Laplace Transform Properties. 2. Inverse Laplace Transform Properties
Week 13	3. Laplace Transform of Periodic Function
Week 14	4. Differential Equation using Laplace Transform
Week 15	Preparatory week before the final Exam
Week 16	**Final Exam**

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Calculus By Thomas	Yes
Recommended Texts	Advanced engineering mathematics by E.Kreyszig	Yes
Websites		

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks %**	**Definition**
Success Group (50 - 100)	**A -** Excellent	امتياز	90 - 100	Outstanding Performance
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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	**Electronic I**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☐ **Lecture** ☒ **Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**ELE202**				
ECTS Credits	**6**				
SWL (hr/sem)	**150**				
Module Level		**UGII**	**Semester of Delivery**		3
Administering Department		Type Dept. Code	**College**	Type College Code	
Module Leader	Hiba Hadi Kurdi		**e-mail**	Hiba199160@gmail.com	
Module Leader's Acad. Title		Asst. Lecturer	**Module Leader's Qualification**		MSc
Module Tutor	Hiba Hadi Kurdi		**e-mail**	Hiba199160@gmail.com	
Peer Reviewer Name		Dr.Mohammed Khalid Ibraheem	**e-mail**	Alobaidi.m.k.i@gmail.com	
Scientific Committee Approval Date		15/06/2023	**Version Number**	1.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	DCC104	**Semester**	1
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 Bipolar junction transistors (BJTs), Basic transistor operation, volt-ampere equation for the BJT. 2. To identify regions of operation, BJT configuration (CB, CE, and CC), and the input and output characteristics. 3. To identify DC biasing of BJT, Operating Point. 4. To analyze fixed biased circuit, voltage feedback circuit with emitter resistor, voltage diver circuit, and CB circuit, Collector Feedback Configuration, Emitter-Follower Configuration, Common-Base Configuration) using NPN and PNP BJT. 5. To analyze Multiple BJT Networks 6. To understand BJT as a switch, Stability factor of BJT and compensation techniques. 7. To demonstrate AC analysis of BJT, Amplification in The Ac Domain, BJT Transistor Modeling, The re Transistor Model. 8. To analyze common-Emitter Fixed-Bias Configuration, Voltage-Divider Bias, CE Emitter-Bias Configuration, Emitter-Follower Configuration, Common-Base Configuration, Collector Feedback Configuration. 9. To demonstrate Collector Dc Feedback Configuration, Effect Of R_L And R_S, Determining The Current Gain. 10. To understand Cascaded Systems and Darlington Connection.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Understand Bipolar junction transistors (BJTs), Basic transistor operation, volt-ampere equation for the BJT. 2. identify regions of operation, BJT configuration (CB, CE, and CC), and the input and output characteristics. 3. identify DC biasing of BJT, Operating Point. 4. analyze fixed biased circuit, voltage feedback circuit with emitter resistor, voltage diver circuit, and CB circuit, Collector Feedback Configuration, Emitter-Follower Configuration, Common-Base Configuration) using NPN and PNP BJT , Multiple BJT Networks 5. understand BJT as a switch, Stability factor of BJT and compensation techniques. 6. demonstrate AC analysis of BJT, Amplification in The Ac Domain, BJT Transistor Modeling, The re Transistor Model. 7. Explain and analyze common-Emitter Fixed-Bias Configuration, Voltage-Divider Bias, CE Emitter-Bias Configuration, Emitter-Follower Configuration, Common-Base Configuration, Collector Feedback Configuration. 8. analyze Collector Dc Feedback Configuration, Effect Of R_L And R_S, Determining The Current Gain. 9. understand Cascaded Systems and Darlington Connection.

Indicative Contents المحتويات الإرشادية	Indicative content includes the following. 1. Bipolar junction transistors (BJTs), • Basic transistor operation • volt-ampere equation for the BJT • regions of operation • BJT configuration (CB, CE, and CC) • the input and output characteristics 2. DC biasing of BJT, • Operating Point, • fixed biased circuit • voltage feedback circuit • circuit with emitter resistor • voltage diver circuit, • CB circuit, • Collector Feedback Configuration • Emitter-Follower Configuration • Common-Base Configuration • Multiple BJT Networks 3. BJT as a switch , Stability factor of BJT and compensation techniques. 4. AC analysis of BJT, • Amplification in The Ac Domain • BJT Transistor Modeling • The re Transistor Model. • Common-Emitter Fixed-Bias Configuration • Voltage-Divider Bias, • CE Emitter-Bias Configuration • Emitter-Follower Configuration • Common-Base Configuration • Collector Feedback Configuration • Collector Dc Feedback Configuration • Effect Of R_L And R_S • Determining The Current Gain • Cascaded Systems and Darlington Connection

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	1. Lectures: Conduct interactive lectures to introduce and explain the fundamental concepts, theories, and principles of each topic. Use visual aids, examples, and demonstrations to enhance understanding and engagement.

	2. Problem-solving Sessions: Organize problem-solving sessions where students can practice solving circuit analysis and design problems related to the module topics. Encourage discussions and collaboration to enhance critical thinking and problem-solving skills. 3. Group Projects: Assign group projects that require students to design and build practical systems. 4. Case Studies: Present real-world case studies where students can analyze and evaluate existing systems, circuits, or devices. Discuss the challenges faced, design considerations, and performance trade-offs. 5. Online Resources: Provide access to online resources, such as textbooks, research papers, video tutorials, and interactive learning platforms, to supplement classroom learning and facilitate self-study. 6. Assessments: Conduct regular quizzes, assignments, and exams to assess students' understanding and progress. Include both theoretical and practical components to evaluate their knowledge and application skills. 7. Feedback and Discussions: Provide timely feedback on assignments and assessments, and encourage students to engage in discussions, asking questions, and seeking clarification on concepts that may be challenging.

Student Workload (SWL)

الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	76	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	5
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	74	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	5
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	150		

Module Evaluation

تقييم المادة الدراسية

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

	Projects Presentation	1	10% (10)	Continuous	All
	Report	1	10% (10)	13	LO # 5, 8 and 10
Summative assessment	**Midterm Exam**	2 hr	10% (10)	6	LO # 1-8
	Final Exam	4hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Bipolar junction transistors (BJTs), Basic transistor operation, volt-ampere equation for the BJT, regions of operation, BJT configuration (CB, CE, and CC), and the input and output characteristics.
Week 2	
Week 3	DC biasing of BJT, Operating Point, (fixed biased circuit, voltage feedback circuit) using NPN and PNP BJT
Week 4	(circuit with emitter resistor, voltage diver circuit, and CB circuit, Collector Feedback Configuration, Emitter-Follower Configuration, Common-Base Configuration) using NPN and PNP BJT
Week 5	
Week 6	Multiple BJT Networks
Week 7	BJT as a switch , Stability factor of BJT and compensation techniques.
Week 8	Midterm Exam 1
Week 9	AC analysis of BJT, Amplification in The Ac Domain, BJT Transistor Modeling
Week 10	The re Transistor Model
Week 11	Common-Emitter Fixed-Bias Configuration, Voltage-Divider Bias, CE Emitter-Bias Configuration
Week 12	Emitter-Follower Configuration, Common-Base Configuration,Collector Feedback Configuration
Week 13	Collector Dc Feedback Configuration, Effect Of R_L And R_S, Determining The Current Gain
Week 14	Cascaded Systems and Darlington Connection
Week 15	**Preparatory week before the final Exam**
Week 16	**Final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Introduction of components
Week 2 **Week 3**	Characteristics of bipolar junction transistor
Week 4 **Week 5**	Transistor DC biasing circuits
Week 6 **Week 7**	Logic gate circuits
Week 8 **Week 9**	Common emitter amplifier NPN
Week 10	The emitter follower
Week 11 **Week 12**	The common base amplifier
Week 13 **Week 14**	Amplifier frequency response

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Electronic Devices and Circuit Theory 11th Edition by Robert Boylestad , Louis Nashelsky	Yes
Recommended Texts	Electronic Devices, Global Edition 10th Edition by Thomas L. Floyd	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	**Networks and Systems**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☐ **Lecture** ☒ **Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**NAS203**				
ECTS Credits	**6**				
SWL (hr/sem)	**150**				
Module Level		**UGII**	**Semester of Delivery**		3
Administering Department		Type Dept. Code	**College**	Type College Code	
Module Leader	Firas Ali Jawad Al-Hasani		**e-mail**	firasissa75@gmail.com	
Module Leader's Acad. Title		Lecturer	**Module Leader's Qualification**		Ph.D.
Module Tutor	Firas Ali Jawad Al-Hasani		**e-mail**	firasissa75@gmail.com	
Peer Reviewer Name		Dr.Hussein Jumaa	**e-mail**	hjjahmn@gmail.com	
Scientific Committee Approval Date		15/06/2023	**Version Number**	1.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	DCC104	**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. Introduce the concept of two-port networks, two-port parameters, relationship between parameters, and connection two-port networks together. 2. Teach the students how to analysis Magnetically Coupled Circuits by introducing the concept of Dot Notation and Equivalent Circuit. 3. Introduce the concepts of Transfer Function, S-Plane, Poles and Zeroes of a transfer function, stability, frequency response, and Bode plot. 4. Introduce the Concept of Passive Filters, Filter Types, Filters Design, and Filters Applications. 5. Study Resonance Circuits, Resonance Frequency, Resonance in Series and Parallel RLC Circuits, and Applications of Resonance Circuits. 6. Teach the students how to find the transient response in the first order RL and RC circuits and in the second order RLC circuits. Introduce the concept of natural and forced responses.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	At the end of the course, the students will be able to: 1. Find the two-port parameters, convert between different parameters, and connect two-port networks. 2. Model transistor and transmission line using two-port parameters. 3. Analysis magnetically coupled circuits. 4. Understand the concept of transfer function, s-plane, poles and zeros, and frequency response. 5. Find the frequency response of a transfer function using Bode plot. 6. Design passive filter sections, and understand filter types. 7. Analysis the resonance circuits, find the resonance frequency, quality factor, resonance circuit selectivity, understand the resonance in series and parallel RLC. 8. Find the transient response in second order circuits. 9. Understand the relation between the roots of differential equations and natural frequencies, and understand the natural and forced responses.
Indicative Contents المحتويات الإرشادية	• Two port networks. • Magnetically coupled circuits and mutual inductance. • Frequency response. • Passive filters. • Resonance. • Transient response.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	1. Lectures. 2. Lab experiments. 3. Tutorials.

	4. Homework and Assignments. 5. Formative and Summative Assessments. 6. In- and Out-Class Questions and Discussions.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	76	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	5
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	74	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	5
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**150**		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	2	10% (10)	11 and 14	LO #6, #7, #8, and #9
	Assignments	2	10% (10)	11 and 14	LO #2, #5, and #9
	Projects / Lab.	1	10% (10)	Continuous	All
	Report	1	10% (10)	13	LO #6, and #7
Summative assessment	**Midterm Exam**	2hr	10% (10)	7	LO #1 - #5
	Final Exam	4hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Two-port networks: impedance parameters, admittance parameters, hybrid parameters, and transmission parameters. relationship between two-port parameters, analysis of terminated two-port networks, interconnected two-port networks.
Week 2	
Week 3	Magnetically coupled circuits, mutual inductance, dot notation, energy in coupled circuits, linear transformer, ideal transformer.
Week 4	

Week 5	Transfer functions, poles and zeroes of transfer function, impulse response, stability concept in s- and time domains, frequency response, Bode-plot.
Week 6	
Week 7	
Week 8	Midterm Exam
Week 9	Passive filters: classification of filters, constant-k filters, m-derived filters, composite filters.
Week 10	Resonance: series resonance, quality factor, selectivity, half power frequencies and bandwidth, parallel resonance, quality factor, selectivity, half power frequencies and bandwidth, series-parallel resonance circuits**.**
Week 11	
Week 12	Transient circuits in s-domain: first order source free R-C and R-L circuits, step response of an R-C circuit, step response of an R-L circuit, second order circuits, source free series RLC circuit, source free parallel RLC circuit, step response of series RLC circuit, step response of parallel RLC circuit, general second order circuits.
Week 13	
Week 14	
Week 15	**Preparatory week before the final Exam**
Week 16	**Final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Introduction to PSPICE
Week 2	Find two-port parameters.
Week 3	Interconnect two port networks.
Week 4	Measure the coupling coefficient and mutual inductance. Find the effect of distance between coils on the value of coefficient of coupling.
Week 5	Find the equivalent circuits of magnetically coupled circuits.
Week 6	Find the impulse response of transfer function.
Week 7	Find the poles and zeros of transfer function.
Week 8	Find the frequency response of transfer function.
Week 9	Draw the frequency response of transfer function using Bode plot.
Week 10	Find the frequency response of a passive constant-k filter.
Week 11	Find the frequency response of a passive m-derived filter.
Week 12	Series resonance circuit.
Week 13	Parallel resonance circuit.
Week 14	First order transient circuits. Second order transient circuits.

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Fundamentals of Electric Circuits, C.K. Alexander and M.N.O Sadiku, McGraw-Hill Education.	Yes
Required Texts	Networks and Systems, D. Roy Choudhury	No
Recommended Texts	Electric Circuits, James W. Nilsson and Susan Riedel	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	**DC Machines and Transformers**			**Module Delivery**	
Module Type	**Core**			☒**Theory** ☐**Lecture** ☒**Lab** ☒**Tutorial** ☐**Practical** ☐**Seminar**	
Module Code	**DCM204**				
ECTS Credits	**8**				
SWL (hr/sem)	**200**				
Module Level	UGII		**Semester of Delivery**	3	
Administering Department	Type Dept. Code		**College**	Type College Code	
Module Leader	Zaid Abdulmahdi Abdulghafar		**e-mail**	zaidalanssari@gmail.com	
Module Leader's Acad. Title	Asst. Lecturer		**Module Leader's Qualification**	MSc.	
Module Tutor	Zaid Abdulmahdi Abdulghafar		**e-mail**	zaidalanssari@gmail.com	
Peer Reviewer Name	Dr. Bashar Sakeen Farhan		**e-mail**	basharfarhan@yahoo.com	
Scientific Committee Approval Date	15/06/2023		**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 working principles of DC electric machines 2 – To learn about the types and characteristics of DC generators 3- To learn about the types and characteristics of DC motors 4- To understand the methods of operating DC motors 5- To learn methods to control the speed of DC motors 6 – To understand the working principles of electrical transformers 7- To identify the characteristics of electrical transformers 8- To recognize the methods of testing electrical transformers and the basic values of transformer elements 9- To learn the methods for calculating losses in transformers 10- To learn about the methods of connecting transformers
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Recognize DC machines construction. 2. Compare types of armature windings. 3. Recognize DC machine types. 4. Demonstrate DC machines characteristics. 5. Identify torque equation and speed equation of DC motor. 6. Explain speed control of DC motor. 7. Identify single phase transformer. 8. Explain theory and EMF equation od a transformer. 9. Describe Fundamental principles of ideal transformer and practical transformer. 10. Draw equivalent circuit and phasor diagram of a single phase transformer. 11. Identify total approximate voltage drop, voltage regulation, Transformer Tests (Open circuit test and Short circuit test) and transformer rating in KVA. 12. Explain losses in a transformer and efficiency of a transformer. 13. Discuss Condition for maximum efficiency and Percentage Resistance, Reactance and Impedance. 14. Recognize three phase transformer and three phase transformer construction. 15. Identify three phase transformer connections and reasons for parallel operation.
Indicative Contents المحتويات الإرشادية	<u>Part A – DC machines</u>

	DC Machines – Magnetism and electromagnetism. Principle of operation of DC generators. . [4 hrs] DC Generator – Construction of a DC machine, Yoke, Poles, armature, Brushes, Brush gear, Bearings Types of armature winding. Coil pitch and distributed winding, Types of armature winding: Lap winding, Wave winding Comparison of lap and wave type winding. Multiplex windings. Winding topologies, single and double layer winding.) Armature reaction and Commutation. Methods of excited. Types of DC generator. Characteristics of DC generators. (Self-excited DC generators. Voltage building in self-excited dc generator. Shunt generator. Series generator. Compound generator). [12 hrs] DC Motor - Principles of operation of DC motors. Characteristics of DC motors and their types (Series motor, shunt motor, compound motor). Torque equation and speed equation of DC motor. Starting of DC motor. Speed control of DC motors. [12 hrs] Review and revision problem classes [4 hrs] <u>Part B - Transformers</u> Construction of transformer. Theory of single-phase transformer. E.M.F Equation of a transformer. Fundamental principles of ideal transformer and practical transformer. Equivalent resistance, reactance and impedances Equivalent circuit of a single phase transformer. [8 hrs] Total approximate voltage drop in a transformer. Transformer Tests (Open circuit test and Short circuit test). Transformer rating in KVA. Voltage regulation of transformer. Losses in a transformer and efficiency of a transformer. Condition for maximum efficiency. Percentage Resistance, Reactance and Impedance. [8 hrs] Three phase transformer. Three phase transformer construction. Three phase transformer connections. Reasons for parallel operation. [8 hrs]

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The main strategies that will be adopted in delivering this module are based on interactive lecturing, solving examples and problems, experimenting and implementing simulated cases, discussions and group work to encourage students' participation in different exercises through the course, while at the same time refining and expanding their knowledge and critical thinking skills. This will be achieved through classes, labs, and interactive tutorials.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	118	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	8
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	**200**		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	3	15% (15)	3 , 12 and 13	LO #1- #2 , #9- #11 and #12- #13
	Assignments	1	5% (5)	11	LO #10
	Projects / Lab.	1	10% (10)	Continuous	All
	Report	1	10% (0)	14	LO #14 and #15
Summative assessment	**Midterm Exam**	2hr	10% (10)	8	LO #1 - #7
	Final Exam	4hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Magnetism and electromagnetism. Principle of operation of DC generators.
Week 2	Construction of a DC machine, Yoke, Poles, armature, Brushes, Brush gear, Bearings. Types of armature winding. (Coil pitch and distributed winding, Types of armature winding: Lap winding, Wave winding Comparison of lap and wave type winding. Multiplex windings. Winding topologies, single and double layer winding).
Week 3	Armature reaction and Commutation. Methods of excited.

Week 4	Types of DC generator. Characteristics of DC generators. (Self-excited DC generators. Voltage building in self-excited dc generator. Shunt generator. Series generator. Compound generator).
Week 5	Principles of operation of DC motors. Characteristics of DC motors and their types.
Week 6	Torque equation and speed equation of DC motor. Starting of DC motor.
Week 7	Speed control of DC motors.
Week 8	Review and revision problems + Mid exam.
Week 9	Construction of transformer. Theory of single-phase transformer. E.M.F Equation of a transformer.
Week 10	Fundamental principles of ideal transformer and practical transformer. Equivalent resistance, reactance and impedances. Equivalent circuit of a single phase transformer.
Week 11	Total approximate voltage drop in a transformer. Transformer Tests (Open circuit test and Short circuit test). Transformer rating in KVA.
Week 12	Voltage regulation of transformer. Losses in a transformer and efficiency of a transformer. Condition for maximum efficiency. Percentage Resistance, Reactance and Impedance.
Week 13	Three phase transformer. Three phase transformer construction.
Week 14	Three phase transformer connections. Reasons for parallel operation.
Week 15	**Preparatory week before the final Exam**
Week 16	**Final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Introduction
Week 2	Safety
Week 3	Insulation test

Week 4	Starting and speed control of DC motor + No load characteristics of DC motor
Week 5	
Week 6	No load characteristics of DC generator
Week 7	
Week 8	Load characteristics of DC machine
Week 9	
Week 10	Three phase transformer tests (Open circuit test and Short circuit test)
Week 11	
Week 12	
Week 13	Load test, efficiency and regulation of three phase transformer
Week 14	

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	A TEXTBOOK OF ELECTRICAL TECHNOLOGY by B.L. THERAJA and A.K. THERAJA	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	**Engineering Economics**			**Module Delivery**	
Module Type	**Elective**			☒ **Theory** ☐ **Lecture** ☐ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**EEC205**				
ECTS Credits	**3**				
SWL (hr/sem)	**75**				
Module Level		**UGII**	**Semester of Delivery**		3
Administering Department		3	**College**		08
Module Leader	Dr. Alaa Hussein ABDULAAL		**e-mail**		Engineeralaahussein@gmail.com
Module Leader's Acad. Title		Lec	**Module Leader's Qualification**		Ph.D.
Module Tutor	Name (if available)		**e-mail**		E-mail
Peer Reviewer Name		Assist. Prof. Baraa Munqith Albaker	**e-mail**		Baraaalbaker@aliraqia.edu.iq
Scientific Committee Approval Date		15/06/2023	**Version Number**		1.0

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

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	1. Develop an understanding of fundamental economic principles: To provide students with a solid foundation in basic economic principles and concepts. This includes concepts such as supply and demand, cost analysis, time value of money, and financial decision-making. 2. Apply economic analysis to engineering projects: To equip students with the skills to apply economic analysis techniques to engineering projects. This involves assessing the financial viability of projects, evaluating investment alternatives, and conducting cost-benefit analyses. 3. Understand the impact of economic factors on engineering decisions: To highlight the importance of economic factors in engineering decision-making. Students will learn to consider economic aspects such as cost, profitability, and risk when making engineering decisions. 4. Economically analyze the integration of distributed energy resources (DERs) in electrical engineering, exploring their financial implications and potential advantages for the electrical grid. 5.Develop financial management skills: To enhance students' financial management skills by teaching them how to analyze costs, calculate financial metrics (e.g., payback period, net present value, internal rate of return), and make informed financial decisions. 6. Evaluate the financial and economic implications of engineering projects: To enable students to assess the financial and economic implications of engineering projects. This includes considering factors such as project financing, cash flow analysis, inflation, taxation, and risk assessment. 7. Enhance communication and presentation skills: To improve students' communication and presentation skills through the presentation of economic analysis results, reports, and project proposals. Students will develop the ability to effectively communicate complex economic concepts and findings to various stakeholders. Overall, the module aims to provide students with the knowledge, skills, and tools necessary to understand the economic aspects of engineering projects and make sound financial decisions. It aims to bridge the gap between engineering and economics, enabling students to consider both technical and economic factors in their professional practice.

Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Understanding principles of engineering economy, cost accounting, time value of money, and cash flow equivalencies. 2. Analyzing cost of product development, financial statements, and ratios. 3. Evaluating stock and bond valuation, project comparisons, break-even points, and payback periods. 4. Constructing retirement planners, considering taxes and inflation in economic studies. 5. Developing internal rate of return (IRR) and net present value (NPV), understanding debt financing and short-term financing. 6. Exploring risk and uncertainty, Capital Asset Pricing Model (CAPM), and entrepreneurial case studies. 7. Applying economic analysis to electric vehicle adoption and distributed energy resources in electrical engineering. These learning outcomes reflect the knowledge and skills that students are expected to acquire upon completing the subjects related to engineering economy .
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. 1. Introduction to engineering economy, cost accounting, and time value of money. 2. Analysis of product development and production costs, including calculation methods. 3. Determination of time-based cash flow equivalencies and financial statement development. 4. Valuation of stocks and bonds, comparison of projects, and case studies on electric vehicle adoption and retirement planning. 5. Consideration of taxes, debt financing, short-term financing, and inflation in economic studies. 6. Exploration of risk and uncertainty, Capital Asset Pricing Model (CAPM), and entrepreneurial case studies. 7. Economic analysis of distributed energy resources in electrical engineering.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Learning and teaching strategies for an engineering economics course involve various approaches to facilitate student understanding and application of economic principles in engineering decision-making. Some strategies include: 1. Active Learning: Encouraging active participation through group discussions, case studies, and hands-on activities to enhance understanding of economic concepts and their practical applications.

	2. Problem-Based Learning: Presenting real-world engineering scenarios and challenges that require students to analyze and apply economic principles to make informed decisions. 3. Technology Integration: Utilizing computer-based tools, software, and simulations to simulate economic scenarios, perform financial analysis, and optimize engineering designs. 4. Real-World Examples: Incorporating real-world case studies and examples from engineering projects to demonstrate the relevance of economic concepts and their impact on decision-making. 5. Assessment and Feedback: Providing regular assessments, assignments, and projects that require students to apply economic principles, analyze data, and make informed decisions. Providing timely and constructive feedback to guide their learning process. 6. Collaborative Learning: Encouraging teamwork and collaborative projects where students work together to analyze economic data, evaluate investment options, and solve complex engineering economics problems. 7. Resources and Support: Providing relevant textbooks, reference materials, and online resources to support students' independent learning and further exploration of engineering economics concepts. These strategies aim to engage students actively, promote deeper understanding of economic principles, and equip them with the skills and knowledge necessary to apply economic analysis in engineering decision-making processes.

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	43	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	3
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, 11	LO #1,2 and 5
	Assignments	2	10% (10)	2, 12	LO # 1 and 7
	Teamwork project	1	10% (10)	12	All
	Report	1	10% (10)	13	LO # 5 and 6
Summative assessment	Midterm Exam	1 hr	10% (10)	7	LO # 1 , 2 and 3
	Final Exam	3 hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	• Introduction to Engineering Economy • Cost accounting and time value of money relationships. • Analysis of how to calculate the cost of developing and producing products
Week 2	• Determining time-based cash flow equivalencies • Development of financial statements and ratios
Week 3	
Week 4	• Stock and Bond Valuation
Week 5	• Comparing mutually exclusive and independent projects.
Week 6	• **Case study** : Economic Analysis of Electric Vehicle Adoption in Electrical Engineering
Week 7	Mid-term Exam + Calculation of break-even points and payback periods
Week 8	Construction of a retirement planner
Week 9	• Including taxes in economy studies. • Development of internal rate of return (IRR) and net present value (NPV)
Week 10	• Impact of debt financing • Short-Term Financing and Cash Management

Week 11	• Including inflation in economy studies. • Entrepreneurial Case Study
Week 12	
Week 13	• Risk and uncertainty. • Capital Asset Pricing Model (CAPM)
Week 14	• **Case study** : Economic Analysis of Distributed Energy Resources in Electrical Engineering
Week 15	**Preparatory week before the final Exam**
Week 16	**Final Exam**

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Principles of Engineering Economic Analysis, White, Case, and Pratt. Wiley & Sons	Yes
Recommended Texts	1. James L.Riggs,David D. Bedworth, Sabah U. Randhawa, "Economics for Engineers", 4Ed, Tata McGraw-Hill 2. Engineering Economic Analysis, Newnan, Eschenbach, Lavelle. Oxford,	Yes
Websites	Non	

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	**Probability and Statistics**			**Module Delivery**	
Module Type	**Base**			☒**Theory** ☐**Lecture** ☐**Lab** ☒**Tutorial** ☐**Practical** ☐**Seminar**	
Module Code	**PNS221**				
ECTS Credits	**4**				
SWL (hr/sem)	**100**				
Module Level		**UGII**	**Semester of Delivery**		4
Administering Department		Type Dept. Code	**College**	Type College Code	
Module Leader	Ruaa Muthanna Ali		**e-mail**	ruaaalmusa@gmail.com	
Module Leader's Acad. Title		Lecturer	**Module Leader's Qualification**		Ph.D.
Module Tutor	Ruaa Muthanna Ali		**e-mail**	ruaaalmusa@gmail.com	
Peer Reviewer Name		Dr. Farqad Talib	**e-mail**	farqad_alani@yahoo.com	
Scientific Committee Approval Date		15/06/2023	**Version Number**	1.0	

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

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	1. To provide students with a thorough grounding in statistical methodology, an awareness of the scope, achievements and possibilities of using statistics. 2. To give students a theoretical and mathematically formal framework for conditional distributions of random variables and for studying the asymptotic behavior of sequences of random variables. 3. To discuss the statistical inference technique of parameter (point) estimation. 4. To extend the knowledge about statistical inference concepts and techniques to (confidence) interval estimation and hypothesis testing of variety of standard statistical tests. 5. Introduce simple analysis-of-variance models. 6. To introduce the students to more complex statistical models like the simple and multiple linear regression models.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Understand and use the terminology of probability and determine whether two events are mutually exclusive and whether two events are independent. 2. Recognize discrete probability distribution functions in addition calculate and interpret expected values. 3. Recognize continuous probability density functions and the uniform probability distribution and apply it appropriately. 4. Apply various types of joint probability distribution to data collection. 5. Demonstrate the concept of point estimation and apply it appropriately. 6. Calculate statistical intervals based on single sample. 7. Conduct and interpret hypothesis tests for a single population mean, population standard deviation unknown. 8. Classify hypothesis tests by type, conduct and interpret hypothesis tests for two population means, population standard deviations known. 9. Analyze the variance in different methods and apply it appropriately. 10. Apply the concepts of ANOVA testing and p-value. 11. Discuss basic ideas of linear regression and correlation and create scatter plots. 12. Distinguish between linear, nonlinear and multiple regression. 13. Conduct and interpret Goodness-of-Fit Tests and Categorical Data Analysis.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. <u>Probability Models</u> Definition of probability, Venn Diagrams and Subsets, Uniform Probability on Finite Spaces. <u>Distributions of Random Variables</u> Discrete Distributions, Continuous Distributions, Joint Distributions, Joint Cumulative Distribution Functions. <u>Point estimation</u> Some General Concepts of Point Estimation, Methods of Point Estimation. <u>Statistical Intervals Based on a Single Sample</u>

	Basic Properties of Confidence Intervals, Large-Sample Confidence Intervals for a Population Mean and Proportion. Tests of Hypotheses Based on a Single Sample Hypotheses and Test Procedures, Tests About a Population Mean, Tests Concerning a Population Proportion, P-Values. Inferences Based on Two Samples z Tests and Confidence Intervals for a Difference Between two Population Means, The Two-Sample t Test and Confidence Interval. The Analysis of Variance and Multifactor analysis of variance Single-Factor ANOVA, Two-Factor ANOVA with Kij = 1, Two-Factor ANOVA with Kij > 1 Simple Linear Regression and Correlation The Simple Linear Regression Mode. Nonlinear and Multiple Regression Assessing Model Adequacy, Regression with Transformed Variables. Goodness-of-Fit Tests and Categorical Data Analysis Goodness-of-Fit Tests When Category Probabilities are Completely Specified.

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	46	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	3
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	54	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	3.6
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)	Continuous	All
	Assignments	2	10% (10)	2, 12	LO # 3, 4, 6 and 7
	Projects	1	10% (10)	10	All
	Report	1	10% (10)	13	LO # 5, 8 and 10
Summative assessment	Midterm Exam	1 hr	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	Probability Models
Week 2	Discrete Random Variables and Probability Distributions
Week 3	Continuous Random Variables and Probability Distributions
Week 4	Joint Probability Distributions and Random Samples
Week 5	Point Estimation
Week 6	Statistical Intervals Based on a Single Sample
Week 7	Tests of Hypotheses Based on a Single Sample + Mid-term Exam
Week 8	Inferences Based on Two Samples
Week 9	The Analysis of Variance and Multifactor Analysis of Variance
Week 10	frequency distribution
Week 11	ANOVA test
Week 12	Simple Linear Regression and Correlation
Week 13	Nonlinear and Multiple Regression
Week 14	Goodness-of-Fit Tests and Categorical Data Analysis
Week 15	**Preparatory week before the final Exam**
Week 16	**Final Exam**

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Probability and Statistics for Engineering and the Sciences, JAY DEVORE, 8th edition	Yes
Recommended Texts	Probability and Statistics the Science of Uncertainty, Michael J. Evans and Jeȝrey S. Rosenthal, Second 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	**Induction Machines**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☐ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**INC222**				
ECTS Credits	**5**				
SWL (hr/sem)	**125**				
Module Level		UGII	**Semester of Delivery**		4
Administering Department		Type Dept. Code	**College**	Type College Code	
Module Leader	AYad Tahseen ABdulhafedh		**e-mail**	ayad.abdulhafedh@aliraqia.edu.iq	
Module Leader's Acad. Title		Assistant lecurer	**Module Leader's Qualification**		Master
Module Tutor	AYad Tahseen ABdulhafedh		**e-mail**	E-mail	
Peer Reviewer Name		Dr.Bashar Sakeen Farhan	**e-mail**	basharfarhan@yahoo.com	
Scientific Committee Approval Date		15/06/2023	**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 Aims أهداف المادة الدراسية	1. To make the students have knowledge about the Electromagnetic field that passes through the Induction machines (Generators and motors). 2. Learn the construction of Induction machine that contains static part (stator), moving part (rotor) and windings on them. 3. How to relate the skills and concepts learned from induction machine (single or three phase) and the different between them. 4. How to use the learned skills to understand and analyzed the equivalent circuits of three phase or single phase induction motors or generators. 5. Learn the important things about the induction machine (the operation, the input power, output power, the torque speed characteristics for rotational part, the efficiency of machines) whether it is single phase or three phase. 6. How can make speed control for induction machine (motor or generator). 7. Representation of an interaction of electric Induction machines with the matter.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	At the end of the course, the students will be able to: 1. Understand the electromagnetic laws for the operation of three phase induction machines. 2. Identify the construction of three phase induction motor. 3. Identify Power and torque, Torque- speed of three phase induction motor. 4. Familiarize with ratings and application of three phase induction motor. 5. Understand the fundamental control practices like starting, reversing and speed control strategies for three phase induction motors. 6. Describe different tests for calculating the performance parameters of three phase motors. 7. Understand the principles operation of three phase induction generators 8. Understand the electromagnetic laws for the operation of single phase induction machines. 9. Familiarize with starting methods and speed control of single phase motors. 10. Describe different tests for calculating the performance parameters of three phase motors. 11. Explain another kind of motor (Stepper motors).
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. <u>Part A Three Phase Induction Machines</u> • Production of Rotating Field: Two-phase supply, Three phase supply. Basic principle and Construction of three phase induction motor: The Development of Induced Torque in an Induction Motor, The Concept of Rotor Slip, The Electrical Frequency on the Rotor [6 hrs.] • Equivalent circuit of three phase induction motors: The Transformer Model of an Induction Motor, The Transformer Model of an Induction Motor, approximate equivalent circuit [3 hrs.]

	• Power and torque of three phase induction motor: Losses and the Power-Flow Diagram, Relation between torque and power factor, starting torque (starting torque of squirrel cage rotor and slip-ring rotor), Condition for maximum torque, effect of changing supply voltage on starting torque, rotor e.m.f and inductance under running conditions, torque under running conditions, condition for maximum torque under running conditions, rotor torque and breakdown torque, relation between torque and slip, Effect of Change in Supply Voltage on Torque and Speed , Effect of Changes in supply Frequency on Torque and Speed , Full-load Torque and Maximum Torque , Starting Torque and Maximum Torque, Torque/Speed Curve , Shape of Torque/Speed Curve, Current/Speed Curve of an Induction Motor, Torque/Speed Characteristic Under Load [9 hrs.]. • Starting of three phase induction motor: Direct on-line start, Star-delta starter, Autotransformer starter, slip ring induction motor starter. Speed control of three phase induction motor: by Pole Changing, by Changing the Line Frequency, by Changing the Line Voltage, by Changing the Rotor Resistance [6 hrs.]. • Rating and application of three phase induction motor [1 hr] • Determining circuit model parameters of three phase induction motors: The No-Load Test, The No-Load Test, and The Locked-Rotor Test [1.5 hrs.]. • The three phase induction generator [1.5 hrs] <u>Part B Single Phase Induction Machines:</u> • Introduction, The Double-Revolving-Field Theory of Single-Phase Induction Motors, starting single-phase induction motors (Split-phase winding, Capacitor-type windings, shaded stator poles), speed control of single phase induction motor, the circuit model of a single-phase induction motor, circuit analysis with the single-phase Induction Motor Equivalent Circuit, testing of single phase induction motors (Blocked Rotor Test, No-load Test) [9 hrs.] • Universal and single-phase AC series motor [1.5 hr] • Single phase repulsion motors [1.5 hr]

Learning and Teaching Strategies

استراتيجيات التعلم والتعليم

Strategies	1-Lectures: Conduct interactive lectures to introduce and explain the fundamental concepts, theories, and principles of each topic. Use visual aids, examples, and demonstrations to enhance understanding and engagement. 2-Problem-solving Sessions: Organize problem-solving sessions where students can practice solving circuit analysis and design problems related to the module topics. Encourage discussions and collaboration to enhance critical thinking and problem-solving skills. 3-Group Projects: Assign group projects that require students to design and build practical systems. 4-Case Studies: Present real-world case studies where students can analyze and evaluate existing systems, circuits, or devices. Discuss the challenges faced, design considerations, and performance trade-offs. 5-Online Resources: Provide access to online resources, such as textbooks, research papers, video tutorials, and interactive learning platforms, to supplement classroom learning and facilitate self-study. 6-Assessments: Conduct regular quizzes, assignments, and exams to assess students' understanding and progress. Include both theoretical and practical components to evaluate their knowledge and application skills. 7-Feedback and Discussions: Provide timely feedback on assignments and assessments, and encourage students to engage in discussions, asking questions, and seeking clarification on concepts that may be challenging.

Student Workload (SWL)

الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	62	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	5
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	63	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	5
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	125		

Module Evaluation

تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	3	15% (15)	5, 11, and 14	LO #1-# 2,#5-#7 , and #8-#10
	Assignments	1	5% (5)	12	LO #5
	Lab.	1	10% (10)	Continuous	All
	Report	1	10% (10)	13	LO # 7
Summative assessment	Midterm Exam	2 hr	10% (10)	6	LO # 1-4
	Final Exam	4hr	50% (50)	16	All
Total assessment			100% (100 Marks)	Total assessment	100% (100 Marks)

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

Week No.	Topic
1	Production of rotating field. Reversal of magnetic field rotation.
2	Basic principle and construction of three phase induction motor: cage and wound rotor types.
3	Equivalent circuit of three phase induction motor. Determination circuit model parameters of three phase induction motor. Determining circuit model parameters
4	Power and torque of three phase induction motor. Torque speed characteristics of three phase induction motor.
5	
6	
7	Rating and application of three phase induction motor+ Mid term Exam
8	Starting of three phase induction motor.
9	Speed control of three phase induction motor.
10	Determining circuit model parameters of three phase induction motors. The three phase induction generator
11	Single phase induction motor (IM), revolving field theory and cross field theory. Analysis of single-phase IM using double revolving field theory. Speed control of single phase induction motor. The circuit model of single phase induction motor.
12	
13	

14	Universal and single-phase AC series motor Single phase repulsion motors
15	Preparatory week before the final Exam
16	Final exam

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Introduction
Week 2	Safety
Week 3	Insulation test and continuity
Week 4	Study of Running and Reversing of Three Phase Induction Motor
Week 5	Study of No Load Test performed in a Three Phase Induction Motor
Week 6	Study of Block Rotor Test performed in a Three Phase Induction Motor
Week 7	Measurement of Slip in a Three Phase Induction Motor
Week 8	Study of Speed-Torque characteristics in a Three Phase Induction Motor
Week 9	Study main components of motor starters
Week 10	
Week 11	Study Direct On Line Motor Starter (DOL)
Week 12	
Week 13	Study Star-delta motor starter
Week 14	

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	BL Theraja. Electrical technology. Vol- II: S Chand & co	Yes
Recommended Texts	J.B. Gupta. Theory & Performance of Electrical Machines: S. K. Kataria & Sons	Yes
Websites	Youtube , google and any link that takes The field of magnetic fields and the electric fields	

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

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

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Computer Programming**			**Module Delivery**	
Module Type	**Basic**			☒ **Theory** ☐ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**CPR223**				
ECTS Credits	6				
SWL (hr/sem)	150				
Module Level		**UGII**	**Semester of Delivery**		4
Administering Department		3	**College**	08	
Module Leader	Mays Afif Anaee		**e-mail**	Mays1989af@gmail.com	
Module Leader's Acad. Title		Assistant Lecturer	**Module Leader's Qualification**		M.sc.
Module Tutor	Name (if available)		**e-mail**	E-mail	
Peer Reviewer Name		Dr. Wassan Saad Hayale	**e-mail**	Wassan.hayale@aliraqia.edu.iq	
Scientific Committee Approval Date		15/06/2023	**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. Familiarize students with the MATLAB environment and its key features. 2. Develop students' proficiency in writing MATLAB programs to solve computational problems. 3. Enable students to utilize MATLAB's built-in functions and libraries effectively. 4. Introduce students to fundamental programming concepts and techniques, such as variables, data types, control structures (loops, conditionals), and functions. 5. Enhance students' ability to manipulate and analyze numerical and symbolic data using MATLAB. 6. Enable students to visualize and plot data in various formats using MATLAB's plotting and visualization capabilities. 7. Encourage students to apply MATLAB for solving real-world problems, including mathematical modeling, data manipulation, and algorithm implementation. 8. Develop students' critical thinking and problem-solving skills through hands-on MATLAB programming assignments and projects.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Demonstrate a comprehensive understanding of the MATLAB environment, its features, and capabilities. 2. Develop proficiency in writing MATLAB programs to solve computational problems, including implementing algorithms and performing data analysis. 3. Utilize MATLAB's built-in functions and libraries effectively to streamline programming tasks and enhance code efficiency. 4. Apply fundamental programming concepts and techniques, such as variables, data types, control structures, and functions, in MATLAB programming. 5. Manipulate and analyze numerical and symbolic data using MATLAB, including performing mathematical operations, data manipulation, and statistical analysis. 6. Visualize and present data effectively using MATLAB's plotting and visualization tools, including generating 2D and 3D plots, histograms, and other graphical representations. 7. Develop the ability to think critically and solve problems using MATLAB, including mathematical modeling, algorithm implementation, and data-driven decision making. 8. Demonstrate effective teamwork and communication skills through collaborative MATLAB programming assignments and projects.
Indicative Contents المحتويات الإرشادية	MATLAB is a powerful programming language and software environment that is widely used in engineering, science, and mathematics. Some of the indicative contents of MATLAB are:

	1. Basic syntax and data types: MATLAB has a simple and intuitive syntax that allows users to perform complex calculations with ease. It supports various data types such as numeric, character, logical, and cell arrays. 2. Mathematical functions: MATLAB provides a wide range of mathematical functions for performing operations such as matrix manipulation, linear algebra, calculus, statistics, and signal processing. 3. Graphics and visualization: MATLAB has powerful tools for creating 2D and 3D plots, graphs, charts, and animations. It also supports image processing and computer vision applications. 4. Programming constructs: MATLAB supports various programming constructs such as loops, conditional statements, functions, classes, and structures. 5. File input/output: MATLAB allows users to read data from files in various formats such as text files, spreadsheets, images, videos, and audio files. It also supports writing data to files in different formats. 6. Toolboxes: MATLAB provides various toolboxes for specific applications such as control systems design, optimization algorithms, machine learning algorithms, neural networks design etc. 7. Simulink: Simulink is a graphical programming environment that is integrated with MATLAB for modeling dynamic systems using block diagrams. 8. Applications: MATLAB is widely used in various fields such as engineering (mechanical engineering), physics (quantum mechanics), finance (portfolio optimization), biology (genomics), chemistry (spectroscopy), etc.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	1. Lectures and Demonstrations: Conducting interactive lectures and demonstrations to introduce MATLAB concepts, syntax, and key functionalities. Using examples to illustrate concepts effectively. 2. Lab Sessions: Conducting interactive workshops or lab sessions where students can apply MATLAB to practical problems under the guidance of instructors. Providing support, answer questions, and offer feedback during these sessions. 3. Assignments and Exams: Assigning regular programming assignments, quizzes, or exams to assess students' understanding of MATLAB concepts.

	4. Semester Project or Report: Guiding students in creating a comprehensive report or mini-project that showcases their understanding and application of MATLAB concepts. This report should demonstrate their ability to solve a real-world problem or complete a substantial MATLAB project, including problem description, methodology, results, and analysis.

Student Workload (SWL)

الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	90	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	6
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	60	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	4
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**150**		

Module Evaluation

تقييم المادة الدراسية

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

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	**MATLAB introduction and M.File**

	Overview of MATLAB as a computational tool Introduction to M-Files for script creation and automation
Week 2	**Variables, Numbers and Functions** Understanding variables and data types in MATLAB Working with numeric data and mathematical functions.
Week 3	**Arithmetic and Logic Operations** Performing arithmetic operations and logical comparisons in MATLAB Utilizing logical operators and conditional statements.
Week 4	**Vectors** introduction to vectors and their manipulation in MATLAB Working with vector operations and indexing
Week 5	**Matrix** Understanding matrices and matrix operations in MATLAB Performing matrix calculations and solving linear systems.
Week 6	**If – Statement** Working with conditional statements and decision-making in MATLAB Implementing if-else and nested if statements.
Week 7	**Mid-term Exam** **Switch-Case Statement** Utilizing switch-case statements for multi-branch decision-making in MATLAB Handling different cases and executing appropriate code blocks.
Week 8	**For Loop Statement** Understanding iteration and repetition using for loops in MATLAB Implementing for loops for efficient coding and automation.
Week 9	**While Loop Statement** Working with while loops for iterative execution in MATLAB Controlling loop termination and flow using conditions.
Week 10	**Continue and Brake Statement** Utilizing continue and break statements to control loop behavior in MATLAB Managing loop iterations and early termination.
Week 11	**Plot Graphics 2D** Introduction to 2D plotting and visualization in MATLAB Creating various types of plots, customizing axes, and adding annotations.
Week 12	**Plot Graphics 3D** Extending plotting capabilities to 3D visualizations in MATLAB Generating 3D plots, surface plots, and contour plots.
Week 13	**Simulink** introduction to Simulink for system modeling and simulation in MATLAB Building and simulating block diagrams for various applications.
Week 14	**Electrical Engineering application with MATLAB** Exploring MATLAB's applications in electrical engineering domains Implementing electrical engineering algorithms and simulations.
Week 15	**Preparatory week before the final Exam**
Week 16	**Final Exam**

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

Week 1	**Introduction and create simple programs.** Hands-on lab session to familiarize students with the MATLAB environment Creating and executing basic programs using MATLAB syntax.
Week 2	
Week 3	**Arithmetic and Logic Operations.** Practical exercises on performing arithmetic operations and logical comparisons in MATLAB Implementing conditional statements and logical operators in MATLAB programs.
Week 4	
Week 5	**Create Vectors and Matrix.** Hands-on lab session focusing on creating and manipulating vectors and matrices in MATLAB Applying vector and matrix operations to solve computational problems.
Week 6	
Week 7	**Flow control statements.** Practical exercises on implementing flow control statements, such as if-else and for loops, in MATLAB programs Solving computational problems using iterative and conditional execution.
Week 8	
Week 9	**Plot Graphics 2D.** Hands-on lab session exploring 2D plotting and visualization techniques in MATLAB Creating various types of 2D plots, customizing their appearance, and adding annotations.
Week 10	
Week 11	**Plot Graphics 3D.** Practical exercises on generating and manipulating 3D plots and visualizations in MATLAB Creating surface plots, contour plots, and other 3D representations of data.
Week 12	
Week 13	**Simulink.** Hands-on lab session introducing Simulink, a graphical programming environment in MATLAB Building and simulating block diagrams to model and analyze dynamic systems
Week 114	

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	+ MATLAB for Electrical and Computer engineering Students and Professionals with Simulink, Roland Priemer. + MATLAB numerical computing, tutorials point.	Yes
Recommended Texts	BASICS O F and Beyond MATLAB, Andrew Knight, year: 2000.	Yes
Websites	https://www.mathworks.com	

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

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

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Applied Physics**			**Module Delivery**	
Module Type	**Basic**			☒ **Theory** ☐ **Lecture** ☐ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**APH224**				
ECTS Credits	**5**				
SWL (hr/sem)	**125**				
Module Level		**UGII**	**Semester of Delivery**		4
Administering Department		Type Dept. Code	**College**	Type College Code	
Module Leader	Ayad Tahseen Abdulhafedh		**e-mail**	ayad.abdulhafedh@aliraqia.edu.iq	
Module Leader's Acad. Title		Assistant teacher	**Module Leader's Qualification**		Master
Module Tutor	Name (if available)		**e-mail**	E-mail	
Peer Reviewer Name		Dr. Ali Kadim Hantoosh	**e-mail**	alialmousoi2006@yahoo.com	
Scientific Committee Approval Date		15/06/2023	**Version Number**		1.0

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	PHY102	**Semester**	1
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 learn the students the basic components in Electric field , Electric flux, Electric displacement. 2. The course has 15 lessons. Each lesson is designed to learn, develop and analyze new forms of solid state physics 3. How to relate the skills and concepts learned from vector analysis to solve Electric. 4. How to use the learned skills to understand, and analyzed the Maxwell's equations. 5. Representation of an interaction of electric field with the matter. 6. Completing static and moving electrical and introducing the student to electrical capacitors and some of their types and the effect of the electric field on them. 7. Studying magnetism and types of magnets. We start with the second part with electromagnetic fields, which is the magnetic field, which is complementary to the electric field in terms of influence. 8. Identifying the magnetic field and how to generate it from the magnet or from the passage of a current with a wire according to the laws of Piot-Savart, as well as Ampere law. 9. Study of the magnetic flux formed by the influence of a magnetic field. 10. Studying the application of magnetic potential, as well as magnetic forces and moments generated as a result of the movement of a positive charge in circular paths.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. An ability to read and comprehend the effects of Electric field. 2. An ability both to follow and correctly to analyze the electromagnetic field interaction with the help of boundary condition. 3. An understanding of physical behavior of electric and magnetic and mater the matter. 4. Providing the student with knowledge of the electric field and its effect on the electric charges in a vacuum or on the surface of a conductor. 5. Through the course, the student will be able to identify complex issues in the subject and find appropriate solutions to them. 6. Developing the student's thinking and feeling and expanding his perception. 7. Through understanding the material and establishing the importance of the material to him and what is its importance in our lives and in all areas of electricity and magnetism. 8. Conducting discussions for students by asking students questions to make students more interactive and allowing for dialogue about what they have learned from the lecture.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following.

	Part A –Vectors calculation and Electric field 1- Vector calculation (Introduction to (EMF) and Vector Analysis, Cartesian coordinates and multiplication of vectors, Cylindrical Coordinates and Spherical Coordinate Systems. [6 hrs] 2- Coulomb's Law and Electric Field Intensity, Field of a Line Charge, Field of a Sheet of Charge and volume charge density. [6 hrs] 3- Electric Flux Density and Gauss's Law ,Application of Gauss's Law: Differential Volume Element .[6 hrs] 4- Energy Expended in Moving a Point Charge in an Electric Field, The Line Integral And The Potential Field of a Point Charge ,Potential Gradient and The Electric Dipole.[4hrs] 5- Current and current density in materials, Properties of conductors and boundary conditions between materials, Boundary conditions between dielectric materials. [6hrs] Part B – The magnetic field 1- Poisson's and Laplace's Equations, Examples of the Solution of Laplace's Equation, The capacitances, their types, and the effect of an electric field on them . [8 hrs] 2-Magnetism, magnetic field and Biot-Savart, Ampere's Circuital Law and the applications [6 hrs]. 3- The Scalar and Vector Magnetic Potentials [4 hrs]. 4- The magnetizing force on a Moving Charge, Forces and torque of a closed magnetic circuit, the magnetic dipole moment. [6 hrs] 5- Magnetization and Permeability .[4 hrs]

Learning and Teaching Strategies

استراتيجيات التعلم والتعليم	
Strategies	1-Lectures: Conduct interactive lectures to introduce and explain the fundamental concepts, theories, and principles of each topic. Use visual aids, examples, and demonstrations to enhance understanding and engagement. 2-Problem-solving Sessions: Organize problem-solving sessions where students can practice solving circuit analysis and design problems related to the module topics. Encourage discussions and collaboration to enhance critical thinking and problem-solving skills. 3-Group Projects: Assign group projects that require students to design and build practical systems. 4-Case Studies: Present real-world case studies where students can analyze and evaluate existing systems, circuits, or devices. Discuss the challenges faced, design considerations, and performance trade-offs. 5-Online Resources: Provide access to online resources, such as textbooks, research papers, video tutorials, and interactive learning platforms, to supplement classroom learning and facilitate self-study. 6-Assessments: Conduct regular quizzes, assignments, and exams to assess students' understanding and progress. Include both theoretical and practical components to evaluate their knowledge and application skills. 7-Feedback and Discussions: Provide timely feedback on assignments and assessments, and encourage students to engage in discussions, asking questions, and seeking clarification on concepts that may be challenging.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	60	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	65	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	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**	3	20% (20)	3,6, 10	LO #1, 2, 10 and 11
	Assignments	4	20% (20)	2,7, 11,13	LO # 3, 4, 6 and 7
	Projects / Lab.				
	Report				
Summative assessment	**Midterm Exam**	1 hr	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/ note: every week has 4 hours.
Week 1	Introduction to (EMF)and Vector Analysis and Dot product. Cross product and Cartesian coordinates system,cylindrical coordinates system
Week 2	Complete the cylindrical coordinates system, Spherical coordinates system Electrical force and Coulomb's Law , Introduction to Electric field.
Week 3	The electric field for (point charge, line charge density) The electric field for surface charge density and volume charge density
Week 4	Electric Flux , Gauss's Law and electric flux density for point charge Application of Gauss's Law
Week 5	First Maxwell equation, Electric flux density for different distribution charges. The Line Integral and The Potential Field of a(Point Charge,line charge density,surface charge density,volume charge density).
Week 6	Potential Gradient and the Electric Dipole, Energy Expended in Moving a Point Charge in an Electric Field. Current and current density in materials and boundary condition for material.
Week 7	Mid-term Exam + Properties of conductors and the electric field for conductor.
Week 8	The Dielectric material and boundary condition of dielectric. Poisson's and Laplace's Equations, Examples of the Solution of Laplace's Equation

Week9	The capacitances, the kinds of capacitors, parallel plate capacitors, cylindrical plates capacitors, spherical plates capacitors. The resistance of different plates capacitors, The relaxation time
Week 10	The electric field of parallel plate capacitors, cylindrical plate capacitor Introduction for Magnetism, magnetic field intensity and Biot-Savart law for magnetic field
Week 11	Ampere's Circuital Law and the applications. The magnetic flux density, the Maxwell equation for magnetic flux density.
Week 12	Introduction for the magnetic potential and scalar potential. The vector magnetic potential and relationship with current density.
Week13	The magnetizing force for (moving charge) The magnetic force for another application (line charge (wire conductor), the sheet of charge).
Week 14	Inductors and Inductances, Magnetic Energy , Magnetic Circuits , Force on Magnetic Materials
Week15	Preparatory week before the final Exam
Week 16	Final Exam

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Engineering Electromagnetics 8th Edition William H. Hayt	Yes
Recommended Texts	Matthew_N_O_Sadiku_Elements_of_Electromagnetic.	Yes
Websites	Youtube , google and any link that takes The field of magnetic fields and the electric fields	

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	**Electronics II**			**Module Delivery**	
Module Type	**Core**			☒**Theory** ☐**Lecture** ☒**Lab** ☐**Tutorial** ☐**Practical** ☐**Seminar**	
Module Code	**ELE225**				
ECTS Credits	**6**				
SWL (hr/sem)	**150**				
Module Level		UGII	**Semester of Delivery**		4
Administering Department		Type Dept. Code	**College**	Type College Code	
Module Leader	Hiba Hadi Kurdi		**e-mail**	Hiba199160@gmail.com	
Module Leader's Acad. Title		Asst. Lecturer	**Module Leader's Qualification**		MSc
Module Tutor	Hiba Hadi Kurdi		**e-mail**	Hiba199160@gmail.com	
Peer Reviewer Name		Dr. Ali Kadim Hantoosh	**e-mail**	alialmousoi2006@yahoo.com	
Scientific Committee Approval Date		15/06/2023	**Version Number**		1.0

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	PHY102	**Semester**	1
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 Field Effect Transistors (FETs), construction and characteristics of JFETs, transfer characteristics 2. To identify Junction field - effect transistor (JFET) operation characteristics. Metal – Oxide semiconductor FET (MOSFET). 3. To identify depletion MOSFET D-MOSFET, E- physical and static enhancement MOŞFET. 4. To analyze FET The main parameters of the operation DC characteristics for different FET types. 5. To demonstrate FET biasing, self-bias configuration, common-gate configuration, JFET voltage-divider bias. 6. To understand the FET as an amplifier, AC analysis of FET 7. Analysis of CS, CD and CG configurations and Small –signal FET models. 8. To identify Multistage Amplifiers, Analysis of multistage amplifiers (voltage gain, current gain) types of multistage amplifiers. 9. To Analysis BJT and JFET Frequency Response, decibels, typical frequency response, low-frequency analysis—bode plot.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Understand the Construction of Field Effect Transistors (FETs), construction and characteristics of JFETs. 2. identify Junction field - effect transistor (JFET) operation characteristics. Metal – Oxide semiconductor FET (MOSFET). 3. Explain physical and static enhancement MOŞFET. 4. analyze FET The main parameters of the operation DC characteristics for different FET types. 5. analyze FET biasing, self-bias configuration, common-gate configuration, JFET voltage-divider bias 6. understand the FET as an amplifier. 7. Calculate 8. Analyze of CS, CD and CG configurations and Small –signal FET models. 9. Investigate BJT and JFET Frequency Response, decibels, typical frequency response, low-frequency analysis—bode plot.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. 1. Field Effect Transistors (FETs). • introduction, construction • characteristics of JFETs. • transfer characteristics 2. Junction field - effect transistor (JFET)

	• operation characteristics. • Metal – Oxide semiconductor FET (MOSFET), • depletion MOSFET D-MOSFET, • E- physical and static enhancement MOŞFET 3. FET The main parameters of the operation DC characteristics for different FET types. 4. FET biasing. • self-bias configuration. • common-gate configuration, • JFET voltage-divider bias. 5. the FET as an amplifier, AC analysis of FET 6. Small –signal FET models, analysis of CS, CD and CG configurations 7. Multistage Amplifiers. • Analysis of multistage amplifiers (voltage gain, current gain) • types of multistage amplifiers (cascade, ... etc.). 8. BJT and JFET Frequency Response, decibels, typical frequency response, low-frequency analysis—bode plot.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	1. Lectures: Conduct interactive lectures to introduce and explain the fundamental concepts, theories, and principles of each topic. Use visual aids, examples, and demonstrations to enhance understanding and engagement. 2. Problem-solving Sessions: Organize problem-solving sessions where students can practice solving circuit analysis and design problems related to the module topics. Encourage discussions and collaboration to enhance critical thinking and problem-solving skills. 3. Group Projects: Assign group projects that require students to design and build practical systems. 4. Case Studies: Present real-world case studies where students can analyze and evaluate existing systems, circuits, or devices. Discuss the challenges faced, design considerations, and performance trade-offs. 5. Online Resources: Provide access to online resources, such as textbooks, research papers, video tutorials, and interactive learning platforms, to supplement classroom learning and facilitate self-study. 6. Assessments: Conduct regular quizzes, assignments, and exams to assess students' understanding and progress. Include both theoretical and practical components to evaluate their knowledge and application skills.

	7. Feedback and Discussions: Provide timely feedback on assignments and assessments, and encourage students to engage in discussions, asking questions, and seeking clarification on concepts that may be challenging.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	76	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	5
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	74	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	5
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	150		

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

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري

	Material Covered
Week 1	Field Effect Transistors (FETs), introduction, construction and characteristics of JFETs, transfer characteristics
Week 2	
Week 3	Junction field - effect transistor (JFET) operation characteristics. Metal – Oxide semiconductor FET (MOSFET), depletion MOSFET D-MOSFET, E- physical and static enhancement MOŞFET.+ Midterm Exam
Week 4	
Week 5	
Week 6	FET The main parameters of the operation DC characteristics for different FET types.
Week 7	
Week 8	FET biasing, self-bias configuration, common-gate configuration, JFET voltage-divider bias.
Week 9	The FET as an amplifier, AC analysis of FET
Week 10	
Week 11	Small –signal FET models, analysis of CS, CD and CG configurations
Week 12	
Week 13	Multistage Amplifiers, Analysis of multistage amplifiers (voltage gain, current gain, etc...) types of multistage amplifiers (cascade, ... etc.). BJT and JFET Frequency Response, decibels, typical frequency response, low-frequency analysis—bode plot.
Week 14	
Week 15	**Preparatory week before the final Exam**
Week 16	**Final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	JFET Characteristics
Week 2	
Week 3	The FET Common Source Amplifier
Week 4	
Week 5	Common Drain and common gate JFET Amplifier
Week 6	

Week 7	
Week 8	N-channel MOSFET output and transfer characteristics
Week 9	
Week 10	Study of Switching Characteristics and Switching Loss of MOSFET
Week 11	
Week 12	Small Signal FET Common-Source Amplifier
Week 13	
Week 14	FET Amplifier Frequency Response

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Electronic Devices and Circuit Theory 11th Edition by Robert Boylestad , Louis Nashelsky	Yes
Recommended Texts	Electronic Devices, Global Edition 10th Edition by Thomas L. Floyd	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	**Arabic Language II**			**Module Delivery**	
Module Type	**Basic**			☒ **Theory** ☒ **Lecture** ☐ **Lab** ☐**Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**ARLA201**				
ECTS Credits	**2**				
SWL (hr/sem)	**50**				
Module Level		2	**Semester of Delivery**		4
Administering Department		Electrical Engineering	**College**	College of engineering	
Module Leader	Dr. Anwar Qutaiba Yahya		**e-mail**	anwar.q.yahya@aliraqia.edu.iq	
Module Leader's Acad. Title		Lecturer Dr.	**Module Leader's Qualification**		
Module Tutor	Name (if available)		**e-mail**	E-mail	
Peer Reviewer Name		Dr. Anwar Qutaiba Yahya	**e-mail**	anwar.q.yahya@aliraqia.edu.iq	
Scientific Committee Approval Date		23/11/2024	**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- تعد اللغة العربية وسيلة للتواصل فهي تحمل رسالة بين المتكلمين ،ولكي تكون هذه الرسالة واضحة ومفهومة يجب ان يكون ترتيب مفرداتها حسب التركيب القواعدي لتلك اللغة . ومن هنا برزت وبشكل جلي ضرورة تدريس القواعد أو النحو في كل اللغات 2- تعرف الطالب على مهارات الكتابية والتعبير والوقوف على مواطن الخطأ لتصويب النطق الصحيح 3- إتقان مهارة الكتابة الصحيحة بمعرفة قواعد الإملاء ولاسيما مواضع الاخطاء الشائعة 4- الحفاظ على اللغة العربية كونها لغة القرآن الكريم 5- التعريف بالمبادئ الاساسية للغة العربية من خلال تنمية المهارات الكتابية والتعبير والمحادثة
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1-اكتساب الطالب معرفة المفاهيم الاساسية للغة العربية وتطبيقها من خلال الأمثلة 2-معرفة كتابة الكلام الصوتي بشكل مضبوط من حيث الاصوات الصحيحة أو المعتلة. 3-اتقان قواعد الجمع بأنواعه (جمع المذكر السالم ، المؤنث السالم ، جمع التكسير) وتطبيقها في التراكيب النحوية المختلفة . 4-يمكن الطالب ايجاد الحلول المناسبة الصحيحة للمشاكل الحقيقية المعقد و تنمية الحس الفكري من خلال أعطاء أمثلة للغة العربية وتطبيقها. 5- تكليف الطلبة بكتابة البحوث والتقارير لاختبار مدى استيعابهم للقواعد الأساسية للغة العربية وتطبيقها في حياتهم اليومية .
Indicative Contents المحتويات الإرشادية	1-ارشاد الطلبة إلى تكوين خزين معرفي من أنظمة اللغة وأحكامها وقواعدها الاساسية 2-ارشاد الطلبة إلى اكتساب مهارات اللغة الاساسية والتدرب عليها من خلال التطبيق العملي كتابة ونطقا 3-ارشاد الطلبة الى الاطلاع على النصوص من الشعر والنثر بمختلف العصور ومحاكاتها في كتابة النصوص التي تعبر عن حياتهم اليومية ومشاعرهم وعواطفهم الذاتية 4-ارشاد الطلبة إلى ما يؤدي الى تعزيز مهاراتهم والانتقال به الى مستوى التفكير العالي 5-ارشاد الطلبة من خلال تعبير عن افكارهم من خلال تكوين مجموعات والتنافس بينهم.

Strategies	1-افضل طريقة في تعليم الطلبة النحو العربي لاهميته في تعلم هذه اللغة واهميته في الترجمة، هي اتباع مبدأ التعاون في التعلم . على ان يتعاون الطلاب في تهيأة مادة الدرس وتقديمها بعد تقسيمهم الى مجاميع تهتم كل مجموعة بجانب مادة الدرس . 2-القاء المحاضرات النظرية بشكل افتراضي مباشرة على السبورة 3-عمل بحوث وتوزيعها على مجاميع طلابية لمعرفة فهمهم للمادة او ادراكهم لها 4-ان الطريقة الاستقرائية باستنباط القاعدة من الامثلة تعد ناجحة في تدريس النحو 5-اهم طرائق التعلم والتعليم هي استراتيجية مهارات التفكير ضمن مجموعة 6- استراتيجية التفكير الناقد في التعلم ، ايضا من اهم طرائقه العصف الذهني

Student Workload (SWL)

الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا

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

Module Evaluation

تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	2	20% (20)	5, 10	All
	Assignments	2	10% (10)	3, 12	All

	Report	1	10% (10)	14	All
Summative assessment	**Midterm Exam**	1hr	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	في الكلام وأجزاؤه
Week 2	علامات البناء
Week 3	الاسماء المبنية
Week 4	في بناء الفعل واعرابه
Week 5	الاسم المعرب وتقسيماته
Week 6	الجمع (المذكر السالم ، والمؤنث السالم ، جمع التكسير)
Week 7	(Mid-term Exam)
Week 8	تقسيمات الاسم من حيث التعريف والتنكير
Week 9	التذكير والتأنيث
Week 10	أفعال المقاربة والرجاء والشروع
Week 11	نواسخ الابتداء (الأفعال الناقصة كان وأخواتها)
Week 12	النواسخ إن وأخواتها
Week 13	نماذج عن أخطاء لغوية شائعة وكيفية المخاطبات الرسمية وكتابة الرسائل والنقاس العملي في مادة اللغة العربية
Week 14	المعرفة والنكرة
Week 15	مراجعة للطلاب قبل المتحان النهائي وأعطاء امثلة من القرآن الكريم وامثلة نحوية

Week 16	**Preparatory week before the final Exam**

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	**الوجيز في اللغة العربية ، محي هلال سرحان ، شرح قطر الندى وبل الصدى، لابن هشام الانصاري ، الاجرومية ابي عبدالله محمد الصنهاجي الاملاء والترقيم في الكتابة العربية ،عبد العليم ابراهيم ، اللغة العربية لغير المختصين ،مصطفى جطل وصلاح كزارة**	Yes
Recommended Texts	**جامع الدروس العربية ، مصطفى الغيلاني ،معاني النحو ، فاضل السامرائي دراسة في قواعد الاملاء د.عبد الجواد الطيب ، موسوعة الشامل في الكتابة والاملاء ،موسى حسن الهديب**	
Websites	**https://www.coursera.org/browse/physical-science-and-engineering/electrical-engineering**	

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

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

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 II**			**Module Delivery**	
Module Type	**Basic**			☒ **Theory** ☒ **Lecture** ☐ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**ENLA202**				
ECTS Credits	**2**				
SWL (hr/sem)	**50**				
Module Level		UGIII	**Semester of Delivery**		4
Administering Department		Type Dept. Code	**College**	Type College Code	
Module Leader	Ali Kadim Hantoosh		**e-mail**	alialmousoi2006@yahoo.com	
Module Leader's Acad. Title		Lecturer	**Module Leader's Qualification**		PhD.
Module Tutor			**e-mail**		
Peer Reviewer Name		Dr.Hussein Jumma Jabir	**e-mail**	hjjahmn@gmail.com	
Scientific Committee Approval Date		15/06/2023	**Version Number**		1.0

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

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	1. To enable the learner to communicate effectively and appropriately in real-life situations. 2. To use English effectively for study purposes across the curriculum. 3. To develop and integrate the use of the four language skills, i.e., listening, speaking, writing and reading. 4. To develop interest in and appreciation of literature. 5. To revise and reinforce structures already learnt. 6. To basically translate from English to Arabic and vice versa.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	students should be able to:- 1. Anticipate and predict what will come next in a text. 2. Deduce the meaning of unfamiliar lexical items in a given context. 3. Consult a dictionary to obtain information on the meaning and use of lexical items. 4. Compare and contrast ideas and arrive at conclusions. 5. Present an argument, supporting it with appropriate examples. 6. Use an appropriate style and format to write an essay. 7. Distinguish main points from supporting details, and relevant from irrelevant information. 8. Understand and interpret messages conveyed in person or by telephone. 9. Participate in spontaneous spoken discourse in familiar social situations.
Indicative Contents المحتويات الإرشادية	Indicative Contents include the following :- **Part A-Grammar: -** English tenses :- (present, past and future) and (simple, continuous, perfect and perfect continuous). Intermediate grammar: Modal verbs, passive voice, and indirect speech. Advanced grammar: conditional sentences, reported speech (8 Hours) **Part B – Four Skills** Reading, writing, speaking and listening (16 Hours) **Part D Translation II : -** Translation a technical report from English to Arabic and from Arabic to English. Electrical engineering terms II. (4 Hours)

Learning and Teaching Strategies استراتيجيات التعلم والتعليم

Strategies	❖ Lectures: In-class lectures delivered by the instructor provide the foundational knowledge and theoretical concepts of English language. Lectures can include explanations, demonstrations, and the presentation of examples to illustrate key concepts. ❖ Interactive Discussions: Encourage active participation and engagement through interactive discussions. This can involve asking questions, facilitating group discussions, and encouraging students to share their insights and perspectives on grammar and English activities . ❖ Group team work: Assign groups that require students to apply their knowledge of English language. ❖ Guest Speakers: Invite language professionals or researchers in the field of language to share their experiences and insights. Guest speakers can provide real-world perspectives, discuss emerging trends, and inspire students in their learning journey. ❖ Online Resources and Multimedia: Provide access to online resources, textbooks, lecture recordings, and interactive multimedia materials that support the learning of English language. These resources can serve as supplementary materials for self-study and reinforce understanding. ❖ Formative and Summative Assessments: Incorporate a variety of assessment methods, including quizzes, assignments, lab reports, and examinations, to evaluate students' understanding and progress. Provide constructive feedback to help students improve their knowledge and skills in English language.

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	4
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	18	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	2.7
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**	3	15% (15)	7, 12	LO #1-8
	Assignments	3	15% (15)	4, 10	All

	Report	1	10% (10)	12	All
Summative assessment	**Midterm Exam**	1 hr	10% (10)	7	LO # 1-6
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
Week	**Material Covered**
Week 1	**Grammer** – English tenses :- (present, past and future) and (simple, continuous, perfect and perfect continuous). Intermediate grammar: Modal verbs, passive voice, and indirect speech. Advanced grammar: conditional sentences, reported speech
Week 2	
Week 3	
Week 4	
Week 5	**Reading:** reading a page on scientific book, reading a question mark
Week 6	
Week 7	**Listening :** listening a scientific lecture +**Mid exam**
Week 8	
Week 9	**Speaking:** speaking a technical report , a seminar
Week 10	
Week 11	**Writing ,** writing a home work , writing an electrical engineering essay
Week 12	
Week 13	**Translation II :** a technical report from English to Arabic and from Arabic to English. Electrical engineering terms.
Week 14	
Week 15	**Preparatory week before the final Exam**
Week 16	**Final Exam**

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	**New Headway Oxford Elementary, Pre-intermediate, and Intermediate**	Yes
Recommended Texts		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
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	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	**Mathematical Analysis**			**Module Delivery**	
Module Type	**Basic**			☒**Theory** ☐**Lecture** ☐**Lab** ☐**Tutorial** ☐**Practical** ☐**Seminar**	
Module Code	**MAN301**				
ECTS Credits	**4**				
SWL (hr/sem)	**100**				
Module Level		**UGIII**	**Semester of Delivery**		5
Administering Department		Type Dept. Code	**College**	Type College Code	
Module Leader	Qasim Hadi Kareem		**e-mail**	Qasim.hadi2017@gmail.com	
Module Leader's Acad. Title		Lecturer	**Module Leader's Qualification**		Ph.D.
Module Tutor	Name (if available)		**e-mail**	E-mail	
Peer Reviewer Name		Assist. Prof. Farqad Talib Najim	**e-mail**	farqad_alani@yahoo.com	
Scientific Committee Approval Date		15/06/2023	**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. Fourier Transform Properties, Convolution Theorem, Power Spectral Density, and Correlation: Students learn signal analysis in the frequency domain, enabling manipulation and analysis of signals based on their frequency components. 2. Signal and Linear Systems: Students understand how signals behave in linear systems, applicable in fields such as telecommunications, control systems, and audio processing. 3. Applications of Fourier Transform: Students explore signal processing applications like image processing, audio compression, and spectral analysis. 4. Laplace Transform: Students gain a powerful tool for analyzing linear time-invariant systems, transforming differential equations into algebraic equations. 5. Laplace Transform Properties and Inversion Techniques: Students learn the properties and techniques for inverting Laplace transforms, aiding in complex system analysis and solution of differential equations. 6. Applications of Laplace Transform: Students apply Laplace Transform in circuit analysis, control systems, and signal processing. 7. Z-Transform: Students analyze and process discrete-time signals and systems, studying stability, frequency response, and filtering. 8. Properties of Z-Transform and Inverse Z-Transform: Students understand the properties and inverse transform techniques, enabling accurate manipulation and analysis of discrete-time signals. 9. Analysis of Discrete-Time Systems: Students analyze the behavior of discrete-time systems, applicable in digital signal processing, communications, and control systems. 10. Matrix Analysis: Students explore linear transformations, eigenvalues, eigenvectors, and Laplace transforms of matrices, relevant in electrical circuit analysis and system modeling.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Proficiency in Signal Analysis: Students will gain a strong understanding of Fourier Transform, Laplace Transform, Z-Transform, and matrix analysis, enabling them to analyze and manipulate signals effectively. 2. Application Skills: Students will be able to apply these transform techniques to solve real-world problems in fields such as communications, control systems, image processing, and circuit analysis. 3. Advanced Problem-Solving: Students will develop advanced problem-solving skills, particularly in dealing with differential equations, linear systems, and boundary condition problems. 4. System Analysis and Modeling: Students will gain the ability to analyze and model linear time-invariant systems, understanding stability, frequency response, and filtering.

	5. Mathematical Proficiency: Students will strengthen their mathematical skills, including complex analysis, linear algebra, and differential equations. 6. Computational and Programming Skills: Students will develop computational and programming skills by implementing numerical algorithms and performing calculations using software tools. 7. Preparation for Advanced Studies: These topics serve as foundational knowledge for advanced studies in fields such as signal processing, control theory, communication systems, and electrical engineering
Indicative Contents المحتويات الإرشادية	1. Fourier Transform Properties, Convolution Theorem, Power Spectral Density, and Correlation: • Definition and properties of Fourier Transform • Convolution theorem and its applications • Power spectral density and its interpretation • Correlation analysis and its significance in signal processing 2. Signal and Linear Systems: • Introduction to signals and systems • Time-domain and frequency-domain representations • Linear time-invariant systems and their properties • Impulse response and transfer function analysis 3. Applications of Fourier Transform: • Frequency analysis and filtering of signals • Image processing techniques using Fourier Transform • Spectral analysis and estimation • Application in audio processing and compression 4. Laplace Transform: • Definition and properties of Laplace Transform • Inverse Laplace Transform and its techniques • Laplace Transform of common functions • Laplace Transform analysis of linear time-invariant systems 5. Z-Transform: • Introduction to discrete-time signals and systems • Definition and properties of Z-Transform • Region of convergence and stability analysis • Z-Transform pairs and inverse Z-Transform techniques 6. Matrix Analysis: • Review of matrix theory and operations • Linear transformations and their properties • Eigenvalues and eigenvectors

	• Application of matrices in electrical circuit analysis and control systems

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	1. Interactive Learning: Students engage in interactive sessions where they actively participate in discussions, ask questions, and collaborate with peers to deepen their understanding of the topics. 2. Problem-Based Learning: Students solve problems and work on assignments that require the application of Fourier Transform, Laplace Transform, Z-Transform, and matrix analysis. This hands-on approach helps them develop critical thinking and problem-solving skills. 3. Practical Applications: Students explore real-world applications of these topics, such as signal processing, circuit analysis, and control systems. This enables them to see the practical relevance of the concepts and enhances their ability to apply them in various domains. 4. Case Studies and Examples: Students analyze case studies and examples that illustrate the concepts in action. This helps them grasp the practical implications and reinforces their understanding of the topics. 5. Group Work and Collaboration: Students engage in group discussions, projects, or presentations to share ideas, learn from each other, and collaborate on problem-solving. This fosters teamwork skills and allows for a diverse range of perspectives.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	46	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	3
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	54	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	3.6
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)	1, 2	LO #1 , 2 and 3
	Assignments	2	10% (10)	3-8	LO # 3, 4 and 5
	Projects / Lab.	1	10% (10)	Continuous	All
	Report	1	10% (10)	9, 10	LO # 6 and 7
Summative assessment	Midterm Exam	1 hr	10% (10)	9	LO # 1-7
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus): Engineering Analysis

المنهاج الاسبوعي النظري لمادة التحليلات الهندسية

	Material Covered
Week 1	Fourier Transform Properties, convolution theorem, power spectral density and correlation
Week 2	Signal and linear systems.
Week 3	Applications on Fourier Transform.
Week 4	Laplace Transform.
Week 5	Laplace transform (existence, convergence, properties, and inversion techniques).
Week 6	Applications (including linear systems, circuit analysis, ordinary differential equations.
Week 7	Z-Transform.
Week 8	Region of convergence, properties of Z-transform, Z-transform pairs.
Week 9	Midterm Exam + The inverse of Z-transform, analysis and discrete-time system, applications.
Week 10	Matrix Analysis.

Week 11	Review of matrix theory, linear transformation, Eigen values and Eigen vectors.
Week 12	Laplace transform of matrices, application of matrices to electrical circuit.
Week 13	Partial Differential Equation.
Week 14	Wave equation, Laplace's equation, solution of boundary condition problems. General solution by separation of variables.
Week 15	**Preparatory week before the final Exam**
Week 16	Final Exam.

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	"numerical methods for engineers" by steven c. chapra and raymond p. canale	No
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	**FX –** Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded

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

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

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Advanced Electronics**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☐ **Lecture** ☒ **Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**AEL302**				
ECTS Credits	**8**				
SWL (hr/sem)	**200**				
Module Level		**UGIII**	**Semester of Delivery**		5
Administering Department		3	**College**		08
Module Leader	Ayad Mahmood Kwad		**e-mail**	Ayad_m_k@yahoo.com	
Module Leader's Acad. Title		Lecturer	**Module Leader's Qualification**		Ph.D.
Module Tutor	Ayad Mahmood Kwad		**e-mail**	Ayad_m_k@yahoo.com	
Peer Reviewer Name		Dr.Mohammed Khalid Ibraheem	**e-mail**	Alobaidi.m.k.i@gmail.com	
Scientific Committee Approval Date		15/06/2023	**Version Number**		1.0

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	ELE202	**Semester**	2
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	1. To understand the fundamental concepts of electronics and the role of electronic circuits in various applications. 2. To analyze and interpret frequency response characteristics of electronic systems using Bode plots and other analysis techniques. 3. To identify and mitigate the multistage frequency effects in cascaded amplifiers and filters. 4. To analyze the performance of feedback amplifiers, including gain, stability, bandwidth, and distortion characteristics. 5. To demonstrate a thorough understanding of operational amplifiers (op-amps) and their applications in electronic circuits. 6. To design and analyze active filters using op-amps, considering different filter types and performance requirements. 7. To design and analyze oscillators, including frequency stability and waveform generation techniques. 8. To analyze the characteristics and design considerations of power amplifiers, including efficiency and output stage configurations.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Understand the concepts of frequency response and its importance in electronic circuits. 2. Analyze and interpret Bode plots and frequency response graphs to determine circuit behavior at different frequencies. 3. Examine the effects of cascading amplifiers and filters on the overall frequency response of a system. 4. Evaluate the impact of gain peaking, loading effects, and compensation techniques in multistage circuits. 5. Explain the principles and benefits of feedback amplifiers, and analyze their gain, stability, bandwidth, and distortion characteristics. 6. Demonstrate a comprehensive understanding of operational amplifiers (op-amps), including their ideal characteristics, configurations, and limitations. 7. Apply op-amps in various applications, such as voltage amplifiers, current amplifiers, active filters, comparators, and oscillators. 8. Design and analyze active filters using op-amps, considering filter types, transfer functions, and component selection. 9. Investigate the principles and design of oscillators, including stability analysis and waveform generation techniques. 10. Analyze the characteristics and design considerations of power amplifiers, including different classes of operation and output stages. 11. Integrate the learned concepts to solve practical engineering problems and design electronic systems. 12. Apply critical thinking and problem-solving skills to analyze, troubleshoot, and optimize electronic circuits. 13. Demonstrate effective teamwork and communication skills through collaborative projects and presentations. 14. Stay updated with emerging trends and advancements in electronics engineering and understand their implications in practical applications.

Indicative Contents المحتويات الإرشادية	Indicative content includes the following. 1. Introduction to Electronics • Basics of electronic circuits and components • Voltage, current, resistance, and power concepts 2. Frequency Response Analysis • Definition of frequency response and its importance • Bode plots and frequency response plots • Transfer function and gain calculation • Bandwidth, resonance, and filters 3. Multistage Frequency Effects • Cascading of amplifiers and filters • Gain peaking and loading effects • Compensation techniques for multistage circuits 4. Feedback Amplifiers • Introduction to feedback systems • Types of feedback (negative and positive) • Analysis of gain, stability, bandwidth, and distortion in feedback amplifiers • Design considerations for stable and high-performance feedback amplifiers 5. Operational Amplifiers (Op-Amps) • Op-amp fundamentals and ideal characteristics • Op-amp circuit configurations (inverting, non-inverting, differential amplifiers) • Op-amp frequency response and limitations • Op-amp specifications and selection 6. Op-Amp Applications • Voltage amplifiers and current amplifiers • Instrumentation amplifiers • Active filters (low-pass, high-pass, band-pass, and band-reject) • Comparators and waveform generators • Oscillators and frequency synthesis 7. Active Filters • Introduction to active filters • Design and analysis of active filters using op-amps • Butterworth, Chebyshev, and Bessel filter responses

	• Filter specifications and component selection 8. Oscillators • Principles of oscillators and oscillator circuits • Analysis and design of oscillators using op-amps • Frequency stability and waveform generation 9. Power Amplifiers • Power amplifier characteristics and classes of operation (Class A, B, AB, C, D) • Design and analysis of power amplifiers • Output stages, biasing techniques, and thermal considerations

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	1. Lectures: Conduct interactive lectures to introduce and explain the fundamental concepts, theories, and principles of each topic. Use visual aids, examples, and demonstrations to enhance understanding and engagement. 2. Hands-on Laboratory Work: Provide hands-on laboratory sessions where students can apply the theoretical concepts learned in lectures. Design experiments that allow students to build and analyze circuits related to frequency response, op-amp applications, active filters, and power amplifiers. 3. Simulations and Software Tools: Utilize circuit simulation software, such as SPICE or MATLAB, to simulate and analyze electronic circuits. Assign exercises and projects that involve designing, simulating, and optimizing various circuits and systems. 4. Problem-solving Sessions: Organize problem-solving sessions where students can practice solving circuit analysis and design problems related to the module topics. Encourage discussions and collaboration to enhance critical thinking and problem-solving skills. 5. Group Projects: Assign group projects that require students to design and build practical electronic systems, such as audio amplifiers, filters, or oscillators. This promotes teamwork, application of knowledge, and practical skills. 6. Case Studies: Present real-world case studies where students can analyze and evaluate existing electronic systems, circuits, or devices. Discuss the challenges faced, design considerations, and performance trade-offs. 7. Online Resources: Provide access to online resources, such as textbooks, research papers, video tutorials, and interactive learning platforms, to supplement classroom learning and facilitate self-study. 8. Assessments: Conduct regular quizzes, assignments, and exams to assess students' understanding and progress. Include both theoretical

	and practical components to evaluate their knowledge and application skills. 9. Feedback and Discussions: Provide timely feedback on assignments and assessments, and encourage students to engage in discussions, asking questions, and seeking clarification on concepts that may be challenging.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	118	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	8
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	200		

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

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Introduction to Electronics and Frequency Response • Basic concepts of electronics and electronic circuits • Low and high frequency response analysis techniques and Bode plots
Week 2	
Week 3	
Week 4	Multistage Frequency Effects • Cascading of amplifiers • Gain peaking
Week 5	Operational Amplifiers (Op-Amps) • Op-amp fundamentals, ideal characteristics, and basic configurations • Op-amp applications as voltage amplifiers and current amplifiers • Comparators, oscillators, and waveform generators using op-amps • Instrumentation amplifiers and their applications
Week 6	
Week 7	Midterm Exam 1
Week 8	Active Filters • Detailed study of active filters and their characteristics • Design and analysis of active filters, including filter types and transfer functions
Week 9	
Week 10	Oscillators • Principles of oscillators and oscillator circuit configurations • Design and analysis of oscillators, stability analysis, and waveform generation
Week 11	
Week 12	Oscillators • Principles of oscillators and oscillator circuit configurations • Design and analysis of oscillators, stability analysis, and waveform generation
Week 13	
Week 14	Power Amplifiers • Power amplifier characteristics and classes of operation (Class A, B, AB, C, D) • Design and analysis of power amplifiers, including output stages, biasing techniques, and heat dissipation considerations.
Week 15	**Preparatory week before the final Exam**
Week 16	**Final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Review and Introduction Lecture
Week 2	Frequency Response of BJT
Week 3	Multistage amplifiers
Week 4	Feedback in BJT Amplifiers (Voltage-Shunt Feedback)
Week 5	Feedback in BJT Amplifiers (Current series feedback)
Week 6	Operation Amplifier (inverting amplifier)
Week 7	Operation Amplifier (Non-Inverting amplifier)
Week 8	Summing Operation Amplifier
Week 9	btractor Operation Amplifier
Week 10	Integrator Op-amp
Week 11	Differentiator Op-amp
Week 12	Low pass filter application of Op-amp
Week 13	High pass filter application of Op-amp
Week 14	555 Timer

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Electronic Devices and Circuit Theory 11th Edition by Robert Boylestad , Louis Nashelsky	Yes
Recommended Texts	Electronic Devices, Global Edition 10th Edition by Thomas L. Floyd	Yes
Websites	http://ayadmk.blogspot.com/p/networking-engineering.html	

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

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

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Synchronous Machines**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☐ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**SYC303**				
ECTS Credits	**5**				
SWL (hr/sem)	**125**				
Module Level	UGIII		**Semester of Delivery**	5	
Administering Department	Type Dept. Code		**College**	Type College Code	
Module Leader	Hiba Hadi Kurdi		**e-mail**	Hiba19916@gmail.com	
Module Leader's Acad. Title	Asst. Lecturer		**Module Leader's Qualification**	MSc	
Module Tutor	Name (if available)		**e-mail**	E-mail	
Peer Reviewer Name	Dr. Bashar Sakeen Farhan		**e-mail**	basharfarhan@yahoo.com	
Scientific Committee Approval Date	15/06/2023		**Version Number**	1.0	

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

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	1. To understand Construction of AC synchronous 2. To identify Salient and non-salient pole types, EMF equation. 3. To identify winding distribution in Ac machines, Chording ,distribution factors, and armature reaction. 4. To analyze the Synchronous generator equivalent circuit and phasor diagram. 5. To demonstrate Power and torque. 6. To understand Synchronous generators operating alone. 7. To identify parallel operation of synchronous generators. 8. To identify performance of generator connected to infinite-bus. 9. To understand Synchronous motor: principle of operation and equivalent circuit and phasor diagram. 10. To identify the Steady state synchronous motor operation. 11. To identify Power-factor control. 12. To identify Torque-speed characteristics, effect of load changes, effect of field current changes. 13. To identify the synchronous capacitor, starting of synchronous motor. Hunting of synchronous machines.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Understand the Construction of AC synchronous machines. 2. Analyze EMF and explain Salient and non-salient pole types. 3. Explain the winding distribution in Ac machines, Chording , distribution factors, and armature reaction. 4. Draw the Synchronous generator equivalent circuit and phasor diagram. 5. Calculate Power and torque. 6. Analyze Synchronous generators operating alone 7. Analyze parallel operation of synchronous generators and investigate the performance of generator connected to infinite-bus. 8. Understand Steady state synchronous motor operation. 9. Explain Power-factor control. 10. Analyze Torque-speed characteristics, effect of load changes, effect of field current changes. 11. Explain starting of synchronous motor. 12. Explain special machines: stepper motors, servo motors and tachometer.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. <u>Part A – Synchronous Machines</u> • Construction of AC synchronous [2hrs.] • Salient and non-salient pole types, EMF equation [2hrs.]

	• Winding distribution in Ac machines. Chording and distribution factors. armature reaction. [2hrs.] Part B – Synchronous Generators • Synchronous generator equivalent circuit and phasor diagram [2 hrs.] • . Power and torque, Measuring model parameters: The relationship between field current and flux (and therefore between the field current and E_A), the synchronous reactance, thee synchronous reactance) , The Short-Circuit Ratio. [2 hrs.] • Synchronous generators operating alone : The Effect of Load Changes on a Synchronous Generator Operating Alone, voltage regulation , Frequency-Power and Voltage-Reactive Power Characteristics of a Synchronous Generator [2 hrs.] • Parallel operation of synchronous generators: The Conditions Required for Paralleling, The General Procedure for Paralleling Generators. Effect of salient poles [2 hrs.]. • Performance of generator connected to infinite-bus, Operation of Generators in Parallel with Other Generators of the Same Size [2 hrs.] Part C – Synchronous Motors • principle of operation • equivalent circuit and phasor diagram. • Steady state synchronous motor operation: The Synchronous Motor Torque-Speed Characteristic Curve, The Effect of Load Changes on a Synchronous Motor, The Effect of Field Current Changes on a Synchronous Motor [4 hrs.]. • Power-factor control: The Synchronous Capacitor or Synchronous Condenser [2 hrs.] • Starting of synchronous motor: Motor Starting by Reducing Electrical Frequency, Motor Starting with an External Prime Mover, Motor Starting by Using Amortisseur Windings. Hunting of synchronous machines, stepper motor, servo motor, and tachometer [2 hrs.]

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	1. Lectures: Conduct interactive lectures to introduce and explain the fundamental concepts, theories, and principles of each topic. Use visual aids, examples, and demonstrations to enhance understanding and engagement. 2. Problem-solving Sessions: Organize problem-solving sessions where students can practice solving circuit analysis and design problems

	related to the module topics. Encourage discussions and collaboration to enhance critical thinking and problem-solving skills. 3. Group Projects: Assign group projects that require students to design and build practical systems. 4. Case Studies: Present real-world case studies where students can analyze and evaluate existing systems, circuits, or devices. Discuss the challenges faced, design considerations, and performance trade-offs. 5. Online Resources: Provide access to online resources, such as textbooks, research papers, video tutorials, and interactive learning platforms, to supplement classroom learning and facilitate self-study. 6. Assessments: Conduct regular quizzes, assignments, and exams to assess students' understanding and progress. Include both theoretical and practical components to evaluate their knowledge and application skills. 7. Feedback and Discussions: Provide timely feedback on assignments and assessments, and encourage students to engage in discussions, asking questions, and seeking clarification on concepts that may be challenging.

Student Workload (SWL)

الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	62	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	63	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	4.2
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	125		

Module Evaluation

تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	3	15% (15)	5, 10, and 14	LO #1-# 2, LO #7 and #10
	Assignments	1	5% (5)	8	LO # 6
	Lab.	1	15% (15)	Continuous	All

	Report	1	5% (5)	14	LO # 9
Summative assessment	**Midterm Exam**	2hr	10% (10)	6	LO # 1-6
	Final Exam	4hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Construction of AC synchronous machines.
Week 2	Salient and non-salient pole types, EMF equation.
Week 3	Winding distribution in Ac machines. Chording and distribution factors, armature reaction.
Week 4	Synchronous generator equivalent circuit and phasor diagram.
Week 5	Power and torque. Measuring model parameters.
Week 6	Midterm Exam 1
Week 7	Synchronous generators operating alone.
Week 8	Parallel operation of synchronous generators. Effect of salient poles.
Week 9	Performance of generator connected to infinite-bus, Operation of Generators in Parallel with Other Generators of the Same Size.
Week 10	Synchronous motor: principle of operation and equivalent circuit and phasor diagram.
Week 11	Steady state synchronous motor operation.
Week 12	
Week 13	Power-factor control
Week 14	Starting of synchronous motor. Hunting of synchronous machines. stepper motor, servo motor, and tachometer
Week 15	**Preparatory week before the final Exam**
Week 16	**Final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Introduction
Week 2	Safety
Weeks 3	Insulation test and continuity test
Weeks 4	To study the Open Circuit Characteristics (OCC) of Three Phase Synchronous Generator
Weeks 5	
Weeks 6	To study the short circuit characteristics (SCC) of three Phase Synchronous Generator
Weeks 7	
Weeks 8	Load Test and correspondingly determine the Efficiency and Voltage Regulation in a Three Phase Generator
Weeks 9	
Week 10	
Week 11	To study the V curve of Three Phase Synchronous Motor
Week 12	
Week 13	To study the Inverse V curve of the Three Phase Synchronous Motor
Week 14	

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts		Yes
Recommended Texts		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	**Communication I**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☐ **Lecture** ☒ **Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**COM304**				
ECTS Credits	**7**				
SWL (hr/sem)	**175**				
Module Level	UGIII		**Semester of Delivery**	5	
Administering Department	Type Dept. Code		**College**	Type College Code	
Module Leader	ALI JASIM MOHAMMED		**e-mail**	ali.laser4@gmail.com	
Module Leader's Acad. Title	Assistant Lecturer		**Module Leader's Qualification**	M.E.	
Module Tutor	ALI JASIM MOHAMMED		**e-mail**	ali.laser4@gmail.com	
Peer Reviewer Name	Asst. Prof. Dr. Malik Abdul Razak		**e-mail**	maliksaady@yahoo.com	
Scientific Committee Approval Date	15/06/2023		**Version Number**	1.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module		**Semester**	
Co-requisites module	EAN301	**Semester**	5

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	1. Students able to understand the concepts of the signals representation and transmission of Analog communication system. 2. To design and analyze Linear Modulation such as Amplitude Modulation (AM), Double Sideband – Suppressed Carrier (DSB-SC), Single Side-Band (SSB), Vestigial Side-Band(VSB) and Angle Modulation(FM, PM). 3. To evaluate the frequency domain and Bandwidth efficiency for modulated signals. 4. To recover and analyze Demodulation signals of Analog system such as (AM) Demodulation, Double Sideband – Suppressed Carrier (DSB-SC), Single Side-Band (SSB), Vestigial Side-Band (VSB) and (FM, PM) Demodulation. 5. To develop skills in analyzing the performance of Analog communication systems.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Demonstrate a comprehensive understanding of the fundamental principles and concepts underlying Analog communication systems, including signal transmission, modulation and demodulation. 2. Describe different types of linear modulation, including DSBSC, DSB with carrier, and SSB techniques. 3. Identify the components of Analog communication system and explain different concepts such as noise, distortion, bandwidth, modulation and demodulation. 4. Recognize the basics of angle (exponential) (frequency and phase) modulation and important concepts such as instantaneous frequency to learn the angle (Frequency and phase) modulation. 5. Describe the superhytrodyne receiver and Phase Locked Loop (PLL) principle. 6. Analyze the functionality of the block diagrams of different systems that are usually used in the linear modulation and demodulation techniques. 7. Design and analyze Linear Modulation such as Amplitude Modulation

	(AM), Double Sideband – Suppressed Carrier (DSB-SC), Single Side-Band (SSB), Vestigial Side-Band (VSB) and Angle Modulation (FM, PM). 8. Analyze and evaluate the frequency domain and Bandwidth efficiency for modulated signals. 9. Apply and analyze demodulation techniques such as linear demodulation and Angle demodulation to recover the original information from modulating signals. 10. Evaluate the performance of Analog communication systems using different techniques of modulation and demodulation.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. 1. Introduction to Analog Communication: Overview of Analog communication systems and their significance in modern engineering. 2. Signals Representation 2.1 Fourier series. 2.2 Hilbert Transform. (15 Hours) 3. Linear Modulation: Linear modulation strategies that constitute the amplitude modulation family: 3.1 Amplitude Modulation (AM) 3.1.1 Modulation process circuit for (AM) signal 3.1.2 Frequency Domain and Bandwidth of (AM signal) 3.1.3 Power in AM signal. 3.1.4 Demodulation of AM signal. 3.1.5 Virtues, Limitations, and Modifications of Amplitude Modulation.(10 Hours) 3.2 Double Sideband-Suppressed Carrier (DSB-SC) 3.2.1 Modulation process circuit for DSB-SC signal. 3.2.2 Frequency Domain and Bandwidth of (DSB-SC signal) 3.2.3 Power in DSB-SC signal 3.2.4 Demodulation of DSB-SC signal. (10 Hours)

	3.3 Single Side-Band (SSB) 3.3.1 Modulators for SSB. 3.3.1.1 Frequency Discrimination Method 3.3.1.2 Phase Discrimination Method. 3.3.2 Power in SSB signal 3.3.3 Coherent Detection or Demodulation of SSB. (10 Hours) 3.4 Vestigial Side-Band (VSB) 3.4.1 Vestigial Sideband (VSB) Modulation 3.4.2 Demodulation of VSB Signals. (5 Hours) 4. Angle Modulation 4.1 Basic Definitions 4.1.1 Phase modulation (PM) 4.1.2 Frequency Modulation (FM). 4.2 Relationship between PM and FM Waves 4.3 Narrow-Band Frequency Modulation. 4.4 Wide-Band Frequency Modulation 4.5 Transmission Bandwidth of FM Waves 4.6 Generation of FM Waves 4.6.1 Direct Method 4.6.2 Indirect Method: Armstrong Modulator. (10 Hours) 4.7 Demodulation of FM Signals 4.7.1 Frequency Discriminator 4.7.2 Phase-Locked Loop 4.8 Commercial FM transmitter. (5 Hours)

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	1. Lectures: Conduct interactive lectures to introduce and explain the fundamental concepts, theories, and principles of each topic. Use visual aids, examples, and demonstrations to enhance understanding and engagement. 2. Hands-on Laboratory Work: Provide hands-on laboratory sessions

	where students can apply the theoretical concepts learned in lectures. Design experiments that allow students to build and analyze Analog communication System. 3. Simulations and Software Tools: Utilize diagram simulation software, such as MATLAB, to simulate and analyze modulation and demodulation of analog signals. 4. Problem-solving Sessions: Organize problem-solving sessions where students can practice solving circuit analysis and design problems related to the module topics. Encourage discussions and collaboration to enhance critical thinking and problem-solving skills. 5. Group Projects: Assign group projects that require students to design and build Analog communication systems, such as AM, FM and PM. This promotes teamwork, application of knowledge, and practical skills.

Student Workload (SWL)

الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	90	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	5
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	85	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	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, 7	LO #2, 4, 8 and 9
	Assignments	2	10% (10)	2, 8	LO # 3, 4 and 8
	Projects / Lab.	1	10% (10)	Continuous	All

	Report	1	10% (10)	13	LO # 2 and 4
Summative assessment	**Midterm Exam**	2 hr	10% (10)	7	LO # 1-3
	Final Exam	4hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus): communication I المنهاج الاسبوعي النظري لمادة الاتصالات 1	
Week	**Material Covered**
Week 1	Introduction to Analog communication system and signals representation.
Week 2	Signals Representation, Fourier series,
Week 3	Hilbert Transform.
Week 4	Linear Modulation, Amplitude Modulation (AM)
Week 5	
Week 6	Double Sideband-Suppressed Carrier (DSB-SC)
Week 7	
Week 8	Mid-term exam
Week 9	Single Side-Band (SSB)
Week 10	

Week 11	Vestigial Side-Band (VSB)
Week 12	Angle Modulation (FM, PM)
Week 13	
Week 14	Demodulation of FM Signals
Week 15	Preparatory week before the final Exam
Week 16	Final Exam

Delivery Plan (Weekly Lab. Syllabus) **المنهاج الاسبوعي للمختبر**	
Week	Material Covered
Week 1	Introduction to Analog communication and Signal Representation Using Matlab Simulink
Week 2	Linear Modulation , Amplitude Modulation (AM)
Week 3	Linear AM demodulation
Week 4	Linear Double Sideband-Suppressed Carrier (DSB-SC) Modulation
Week 5	Linear Double Sideband-Suppressed Carrier (DSB-SC) Demodulation
Week 6	Linear Single Side-Band (SSB) Modulation
Week 7	Linear Single Side-Band (SSB) Demodulation
Week 8	Mid-term Exam
Week 9	Angle Modulation, Frequency Modulation (FM)
Week 10	Angle Modulation, (FM) Demodulation
Week 11	Angle Modulation, Phase Modulation (PM)

Week 12	Angle Modulation, (PM) Demodulation
Week 13	Spectral Characteristics of AM &FM
Week 14	PLL as FM Demodulator

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Communication systems, 4th edition, Simon Haykin.	No
Recommended Texts	Data communications and networking, 4th edition, Behrouz A. Forouzan	Yes
Websites	http://www.electronics-tutorials.ws/combination	

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 Ethics**			**Module Delivery**	
Module Type	**Support**			☒ **Theory** ☐ **Lecture** ☐ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**ETH305**				
ECTS Credits	**3**				
SWL (hr/sem)	**75**				
Module Level		**UGII**	**Semester of Delivery**		**5**
Administering Department		Type Dept. Code	**College**	Type College Code	
Module Leader	Dr. Alaa Hussein ABDULAAL		**e-mail**	Engineeralaahussein@gmail.com	
Module Leader's Acad. Title		Asst.Lec	**Module Leader's Qualification**		Ph.D.
Module Tutor	Name (if available)		**e-mail**	E-mail	
Peer Reviewer Name		Dr. Firas A. Al-Hasani	**e-mail**	firasissa75@gmail.com	
Scientific Committee Approval Date		15/06/2023	**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. An understanding of their duties and responsibilities as professionals through gaining knowledge of the philosophies of ethics, professional practice, and world culture. 2. Basic knowledge to make informed ethical decisions when confronted with problems in the working environment. 3. Improved awareness of potential ethical issues within an engineering context. 4. Team skills through working in teams on assignments and in-class assignments. 5. Subjective analytical skills through investigation and evaluation of ethical problems in engineering settings using accepted tests for moral problem solving. 6. An understanding of how societal morals varies with culture and how this influences ethical thought and action. 7. Improved communications skills with regard to ethical and professional issues in engineering. 8. Know some of the classic cases as well as contemporary issues in engineering ethics.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Students will have the improved ability to function on multidisciplinary teams. 2. Students will have an understanding of professional and ethical responsibility. 3. Students will have an improved ability to communicate effectively. 4. Students will have the broad education necessary to better understand the impact of engineering solutions in a global/societal context. 5. Students will have recognition of the need for and an ability to engage in lifelong learning. 6. Students will have knowledge of contemporary issues.

Indicative Contents المحتويات الإرشادية	This course is designed to introduce undergraduate engineering students to the concepts, theory and practice of engineering ethics. It will allow students to explore the relationship between ethics and engineering and apply classical moral theory and decision making to engineering issues encountered in academic and professional careers.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Learning and teaching strategies for engineering ethics play a crucial role in fostering ethical awareness, knowledge, and decision-making skills among engineering students. Here are some effective strategies for both learning and teaching engineering ethics: **Learning Strategies:** **Case Studies**: Engage students in analyzing real-life case studies that involve ethical dilemmas in engineering. Encourage them to identify ethical issues, consider alternative solutions, and discuss the consequences of different actions. This approach helps students understand the complexities of ethical decision-making in engineering practice. **Ethical Reflection and Discussion**: Encourage students to reflect on their own ethical values and biases. Create a safe and open environment for discussion where students can express their perspectives and engage in ethical debates. This helps in developing critical thinking skills and ethical reasoning abilities. **Role-Playing and Scenarios**: Conduct role-playing exercises or scenarios where students are assigned different roles in ethical dilemmas. This interactive approach allows students to experience the challenges of making ethical decisions, understand different perspectives, and develop empathy towards stakeholders involved. Guest Speakers and Industry Experts: Invite guest speakers from industry or ethics professionals to share their experiences and insights on ethical issues in engineering. This provides students with real-world perspectives and helps bridge the gap between theory and practice. Incorporate Ethical Codes and Standards: Introduce students to relevant ethical codes and standards in engineering, such as those provided by professional engineering

	organizations. Discuss the principles, guidelines, and responsibilities outlined in these codes and encourage students to apply them in their engineering practice. **Teaching Strategies:** **Ethical Dilemma Quizzes:** Create short quizzes that present students with ethical scenarios or case studies. Ask multiple-choice or short-answer questions that require students to analyze the situations, identify ethical issues, and propose appropriate courses of action. Quizzes can be administered regularly to reinforce learning and assess students' grasp of ethical concepts. **Integrating Ethics in Engineering Curriculum:** Integrate ethics education throughout the engineering curriculum rather than limiting it to a single course. Infuse ethical discussions, case studies, and assignments into technical courses to emphasize the ethical dimensions of engineering practice. **Active Learning Approaches:** Utilize active learning methods such as group discussions, problem-solving activities, and collaborative projects. These approaches engage students in applying ethical principles to real-world engineering challenges, fostering a deeper understanding of ethical issues. **Role of Professionalism and Integrity:** Emphasize the importance of professionalism, integrity, and social responsibility in engineering practice. Encourage students to reflect on the impact of their decisions and actions on society, the environment, and public welfare. **Ethical Dilemma Analysis:** Provide students with structured frameworks or models to analyze ethical dilemmas, such as ethical decision-making models or ethical frameworks in engineering. Guide students in systematically evaluating alternatives, considering the ethical implications, and reaching informed decisions. **Ethical Case Studies and Examples:** Incorporate ethical case studies and examples from engineering practice into lectures and discussions. This helps students connect theoretical concepts with real-world applications and enhances their ability to recognize and address ethical issues. **Ethical Reflection and Writing Assignments:** Assign reflective writing exercises where students critically analyze ethical issues, their personal values, and the impact of ethical decisions. These assignments encourage self-reflection and help students articulate their ethical reasoning. **Current Events Analysis:** Assign students to analyze recent news articles or events related to engineering ethics. Ask them to identify the ethical challenges presented, discuss the potential implications, and propose recommendations for addressing these issues. This assignment helps students stay informed about current ethical concerns in the engineering field. **Teaching engineering ethics is an ongoing process that requires continuous reinforcement, discussions, and reflection. By employing a combination of these strategies, students can develop the ethical competence needed to navigate complex ethical challenges in their engineering careers.**

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	43	**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	15% (15)	5, 10	LO #1, 2, 10 and 11
	Assignments	2	10% (10)	2, 12	LO # 3, 4, 6 and 7
	Report	1	15% (15)	13	LO # 5, 8 and 10
Summative assessment	**Midterm Exam**	1 hr	10% (10)	8	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	• Course introduction and overview • Morals and ethics • Comparison of ethics and engineering ethics • Ethics at personal and student level
Week 2	• The concept of professions

	• The importance of ethics in science and engineering • The role of codes of ethics • Professional responsibilities of engineers
Week 3	• The concept of morality • The importance of core values • Moral/ethical dilemmas and hierarchy of moral values • Factors affecting moral responsibility, and degrees of responsibility
Week 4	• Overview of ethical theories and applications
Week 5	• Basics of ethical analyses and decision-making
Week 6	• The importance if intention • Truth (personal and social) • The concept of whistleblowing
Week 7	• Ethical leadership in engineering and society • Conflicts of interests
Week 8	• Engineers in organizations • Ethics in the workplace
Week 9	• Fairness (personal and social) +**Mid-term Exam**
Week 10	• Specific case example – Challenger Incident
Week 11	• Reliability, risk and safety • Risk management • Resource allocations
Week 12	• Ethics in the electronic and digital age • Privacy and confidentiality issue
Week 13	• Responsible conduct of research • Intellectual property and society • Ethics and the environment • Innovation and ethics

Week 14	• Sustainable engineering • Global and cultural considerations
Week 15	• **Preparatory week before the final Exam**
Week 16	• **Final Exam**

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	1. Seebauer, E.G. and Barry, R.L. *Fundamental of Ethics for Scientists and Engineers* (New York: Oxford University Press, 2001). 2. Roland Scherzinger (Introduction To Engineering Ethics).	Yes
Recommended Texts	• Martin, M.W. and R. Schinzinger. *Ethics in Engineering.* 4th Edition. (McGraw- Hill, Inc., 2005). • Harris Jr., C.E., Pritchard, M.S., Rabins, M.J., *Engineering Ethics, Concepts, and Cases*: 4th edition (California: Wadsworth Learning, 2009). • Whitbeck, Caroline. *Ethics in Engineering – Practice and Research*: 2nd edition (Cambridge: Cambridge University Press, 2011).	Yes
Websites	https://lss.at.ufl.edu/help.shtml.	

Grading Scheme مخطط الدرجات

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

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

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Project Management**			**Module Delivery**	
Module Type	**Elective**			☒**Theory** ☐**Lecture** ☐**Lab** ☐**Tutorial** ☐**Practical** ☐**Seminar**	
Module Code	**PRM306**				
ECTS Credits	**3**				
SWL (hr/sem)	**75**				
Module Level		**GIII**	**Semester of Delivery**		5
Administering Department		3	**College**		08
Module Leader	Asst. Prof. Dr. Ahmed Khalaf and Asst. Lect. Mustafa Mohammed Juad		**e-mail**		dr.ahmedkhlf@gmail.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		Asst. Prof. Dr. Baraa Munqith Albaker	**e-mail**		baraaalabker@aliraqia.edu.iq
Scientific Committee Approval Date		15/06/2023	**Version Number**		1.0

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

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	1. To understand the key concepts and principles of project management and how they apply to electrical engineering projects. 2. To develop skills in project planning, scheduling, budgeting, and resource management within the electrical engineering context. 3. To gain knowledge of risk management techniques and strategies to identify and mitigate risks associated with electrical engineering projects. 4. To learn how to effectively communicate and collaborate with stakeholders, clients, and project team members in electrical engineering projects. 5. To acquire an understanding of quality control and assurance processes specific to electrical engineering projects to ensure project deliverables meet specified standards. 6. To familiarize students with the legal, regulatory, and safety considerations involved in managing electrical engineering projects. 7. To provide students with practical insights and case studies to apply project management principles to real-world electrical engineering projects. 8. To develop critical thinking and problem-solving skills to address project challenges and make informed decisions in the electrical engineering project environment. 9. To cultivate an awareness of ethical, social, and environmental implications related to electrical engineering projects and incorporating sustainable practices. 10. To prepare students to effectively lead and manage electrical engineering projects by developing leadership and team management skills.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Demonstrate an understanding of project management principles, methodologies, and best practices as applied to electrical engineering projects. 2. Apply project initiation techniques to effectively define project objectives, scope, and deliverables in the electrical engineering context. 3. Develop project plans, including work breakdown structures, schedules, and resource allocations, for electrical engineering projects. 4. Identify and analyze risks specific to electrical engineering projects and implement appropriate risk management strategies. 5. Apply techniques for monitoring and controlling project progress, including tracking milestones, managing project changes, and ensuring quality standards are met in electrical engineering projects. 6. Communicate effectively with project stakeholders, both technical and non-technical, in the electrical engineering field, ensuring clear and concise information exchange. 7. Collaborate with interdisciplinary teams to manage electrical engineering projects, utilizing leadership and teamwork skills to achieve project

	objectives. 8. Evaluate project performance, analyze lessons learned, and apply continuous improvement strategies to future electrical engineering projects. 9. Recognize the importance of sustainable practices in electrical engineering projects and incorporate environmental and social responsibility principles into project planning and execution.
Indicative Contents المحتويات الإرشادية	1. Introduction to Project Management o Definition and importance of project management o Project life cycle and phases o Key project management processes and knowledge areas 2. Project Initiation o Project selection and justification o Stakeholder identification and analysis o Defining project objectives and scope in electrical engineering projects 3. Project Planning o Work breakdown structure (WBS) development o Activity identification and sequencing o Resource estimation and allocation in electrical engineering projects o Developing a project schedule and critical path analysis 4. Risk Management o Identification, assessment, and prioritization of risks in electrical engineering projects o Risk response planning and mitigation strategies o Contingency planning for unforeseen events in electrical engineering projects 5. Project Execution and Control o Managing project team and communication o Monitoring project progress and performance o Change management and configuration control in electrical engineering projects o Quality control and assurance in electrical engineering projects 6. Project Closure o Project evaluation and lessons learned o Documentation and knowledge transfer in electrical engineering projects o Handover and transition of project deliverables 7. Stakeholder Management o Identifying and engaging project stakeholders o Managing stakeholder expectations and communications in electrical engineering projects o Conflict resolution and stakeholder engagement strategies 8. Procurement and Contract Management o Vendor selection and contract negotiation for electrical engineering projects o Contract administration and supplier management o Managing procurement risks and contracts in electrical engineering projects 9. Leadership and Team Management

	○ Leadership styles and skills in the context of electrical engineering projects ○ Building and managing high-performing project teams ○ Motivating and resolving conflicts within project teams 10. Ethical and Legal Considerations ○ Ethical practices in electrical engineering project management ○ Compliance with industry standards and legal regulations ○ Intellectual property and confidentiality considerations 11. Sustainability in Electrical Engineering Projects ○ Environmental and social responsibility in project planning and execution ○ Integration of sustainable practices in electrical engineering projects ○ Energy efficiency and renewable energy considerations

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

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	32	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	43	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	3
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**
	Quizzes	2	10% (10)	5, 10	LO #1, 2, 10 and 11

Formative assessment	**Assignments**	2	10% (10)	2, 12	LO # 3, 4, 6 and 7
	Teamwork Project	1	10% (10)	14	All
	Report	1	10% (10)	13	LO # 5, 8 and 9
Summative assessment	**Midterm Exam**	1 hr	10% (10)	7	LO # 1-7
	Final Exam	3 hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1 and Week 2	**Introduction to project management:** An overview of project management principles, methodologies, and best practices, including project initiation, planning, execution, monitoring, and closure.
Week 3 and Week 4	**Project integration management:** The process of coordinating various project elements, such as scope, schedule, budget, resources, and stakeholders, to ensure successful project execution.
Week 5 and Week 6	**Electrical engineering project life cycle:** Understanding the specific phases and activities involved in electrical engineering projects, including design, procurement, construction, testing, and commissioning.
Week 7	**Midterm Exam + Scope management:** Defining and managing the project scope.
Week 8	**Schedule management:** Developing project schedules, identifying critical paths, determining activity durations, and utilizing scheduling techniques specific to electrical engineering projects.
Week 9	**Cost management:** Estimating and managing project costs.
Week 10	**Risk management:** Identifying, assessing, and managing project risks specific to electrical engineering projects.
Week 11	**Quality management:** Ensuring that project deliverables meet specified quality standards, implementing quality control processes.
Week 12	**Resource management:** Managing project resources, including human resources, equipment, and materials, to optimize project performance and meet project objectives.
Week 13	**Communication management:** Establishing effective communication channels, facilitating information exchange among project team members, stakeholders, and clients.
Week 14	**Project monitoring and control:** Tracking project progress, monitoring performance metrics, conducting regular project status reviews, and implementing corrective actions as needed.
Week 15	**Preparatory week before the final Exam**
Week 16	**Final Exam**

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	John M. Nicholas and Herman Steyn, "Project Management for Engineering, Business and Technology", 5th Edition , Routledge, 2020.	No
Recommended Texts	Mohammad Shahidehpour, Hatim Yamin, and Zuyi Li, "Project Management in Electrical Power Systems", 1st edition, Wiley, 2016.	No
Websites		

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

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

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**ANTENNA AND PROPAGATION**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☐ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**APR321**				
ECTS Credits	**6**				
SWL (hr/sem)	**150**				
Module Level	UGIII		**Semester of Delivery**	6	
Administering Department	Type Dept. Code		**College**	Type College Code	
Module Leader	MOHAMMED KHALID		**e-mail**	ALOBAIDI.M.K.I@GMAIL.COM	
Module Leader's Acad. Title	Lecturer		**Module Leader's Qualification**	Ph.D.	
Module Tutor	Name (if available)		**e-mail**	E-mail	
Peer Reviewer Name	Assist. Prof. Anas Fouad Ahmed		**e-mail**	anasfuad33eng@yahoo.com	
Scientific Committee Approval Date	15/06/2023		**Version Number**	1.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	MAT201	**Semester**	3
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	1. Understanding Antennas: The module aims to provide students with a solid foundation in the principles and theory of antennas. This includes understanding the different types of antennas, their characteristics, and their applications in various communication systems. 2. Radiation Fundamentals: Students are expected to gain knowledge about the fundamental concepts of electromagnetic radiation, including the generation, propagation, and reception of electromagnetic waves. This includes understanding concepts such as polarization, radiation patterns, and antenna gain. 3. Antenna Parameters and Performance: The module aims to familiarize students with the different parameters that describe the performance of antennas. This includes concepts such as impedance, bandwidth, efficiency, and directivity. Students should be able to analyze and evaluate the performance of antennas based on these parameters. 4. Antenna Design and Analysis: The module aims to develop the skills necessary for designing and analyzing antennas. Students will learn about various design techniques, simulation tools, and optimization methods used in antenna design. They will also gain practical experience in designing antennas for specific applications. 5. Propagation of Electromagnetic Waves: The module aims to provide an understanding of how electromagnetic waves propagate through different media, such as free space, atmosphere, and various materials. This includes studying the concepts of path loss, multipath propagation, fading, and other propagation phenomena. 6. Applications and Emerging Technologies: The module aims to explore the practical applications of antennas and propagation in various fields, such as wireless communications, satellite systems, radar systems, and wireless sensor networks. It may also cover emerging technologies and trends in antenna design and propagation.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Knowledge of Antenna Types and Characteristics: Students will gain a comprehensive understanding of various antenna types, such as wire antennas, aperture antennas, and array antennas. They will learn about the characteristics and properties of different antennas, including radiation patterns, impedance, bandwidth, and polarization. 2. Understanding of Electromagnetic Wave Propagation: Students will develop a solid understanding of how electromagnetic waves propagate through different media, including free space, atmosphere, and various materials. They will learn about concepts such as path loss, diffraction, reflection, refraction, scattering, and multipath propagation. 3. Ability to Design and Analyze Antennas: Students will acquire the skills to design and analyze antennas for specific applications. They will learn design

techniques, simulation tools, and optimization methods used in antenna design. They will be able to evaluate antenna performance based on parameters such as impedance matching, radiation efficiency, and directivity.

4. Familiarity with Antenna Measurement Techniques: Students will learn about the different measurement techniques used for characterizing antennas. They will gain hands-on experience with antenna measurement equipment and learn how to interpret measurement results. They will also understand calibration procedures and sources of measurement errors.
5. Application of Antenna and Propagation Principles: Students will be able to apply their knowledge of antennas and propagation to practical applications. They will understand how antennas are used in various communication systems, including wireless networks, satellite systems, radar systems, and wireless sensor networks. They will also be aware of emerging technologies and trends in antenna design and propagation.
6. Analytical and Problem-Solving Skills: Through coursework and practical exercises, students will develop analytical and problem-solving skills related to antenna design, analysis, and propagation. They will be able to analyze complex antenna systems, identify potential issues, and propose appropriate solutions.
7. Communication and Presentation Skills: Students will enhance their communication and presentation skills through assignments, projects, and presentations related to antennas and propagation. They will learn how to effectively communicate their ideas, designs, and findings to both technical and non-technical audiences.
8. Analysis of Antenna Performance in Different Environments: Students will learn to analyze the performance of antennas in various environmental conditions. They will understand the impact of different factors such as terrain, buildings, and atmospheric conditions on signal propagation and antenna performance. They will gain the ability to assess and optimize antenna performance for specific deployment scenarios.
9. Knowledge of Advanced Antenna Technologies: Students will be exposed to advanced antenna technologies and concepts. This may include topics such as smart antennas, phased arrays, beamforming, and adaptive antenna systems. They will understand the principles and applications of these technologies, and how they can enhance the performance and efficiency of communication systems.
10. Antenna Integration and System Considerations: Students will gain an understanding of the integration of antennas into communication systems. They will learn about the considerations and challenges involved in antenna placement, impedance matching, interference mitigation, and system-level optimization. They will be able to design antenna systems that meet the requirements of specific applications.
11. Antenna Modeling and Simulation: Students will acquire skills in modeling and simulating antennas using software tools and numerical techniques. They will learn how to use simulation software to analyze antenna performance, optimize designs, and predict radiation patterns. They will be

	able to validate their designs through simulations and understand the limitations of modeling approaches.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. <u>Part A – Antenna theory</u> Introduction to Antenna and Propagation-Course overview and objectives-Introduction to electromagnetic waves and their properties-Basic concepts of antenna radiation and propagation- Antenna parameters and characteristics Radiation patterns and antenna gain-Polarization and impedance matching- Wire Antennas. [15 hrs] Aperture Antennas Patch antennas (rectangular, circular)-Horn antennas and their characteristics-microstrip antenna. [15 hrs] Parabolic reflector antennas- Antenna Arrays-Array configurations and properties Array factors and pattern synthesis-Beamforming techniques and applications . [10 hrs] Modeling techniques and software tools-Numerical methods for antenna analysis-Simulation of radiation patterns and antenna performance. [15 hrs] Revision problem classes [6 hrs] <u>Part B – Electromagnetic propagation</u> Propagation Fundamentals Propagation mechanisms and models-Free space propagation and path loss-Friis transmission equation and link budget analysis. [15 hrs] path loss-Friis transmission equation and link budget analysis[7 hrs] Multipath Propagation Reflection, refraction, and diffraction-Multipath fading and channel models-Diversity techniques for mitigating fading effect. [15 hrs]

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	1. Lectures: Lectures are a fundamental component of the course where the instructor delivers content and explanations of key concepts, theories, and principles related to antennas and propagation. This strategy helps provide a comprehensive understanding of the subject matter and introduces students to new topics. 2. Hands-on Laboratory Sessions: Laboratory sessions allow students to apply theoretical knowledge to practical scenarios. They may involve antenna measurements, design exercises, and simulation software usage. These sessions provide students with hands-on experience in working with antennas, measuring their characteristics, and analyzing their performance. 3. Assignments and Projects: Assignments and projects allow students to delve deeper into specific topics and develop problem-solving skills. They may involve designing antennas for specific applications, analyzing antenna performance in different scenarios, or conducting research on emerging antenna technologies. These assignments and projects encourage critical thinking, independent learning, and application of concepts. 4. Group Discussions and Presentations: Group discussions and presentations provide opportunities for students to engage in peer-to-peer learning. Students can discuss and analyze case studies, solve problems collaboratively, and present their findings to the class. This strategy encourages active participation, communication skills, and the exchange of ideas among students. 5. Computer Simulations and Modeling: Computer simulations and modeling software can be used to enhance learning and understanding of antenna behavior. Students can simulate antenna designs, analyze their performance, and visualize radiation patterns. This strategy allows students to gain practical experience in antenna design and analysis using virtual tools. 6. Guest Lectures and Industry Collaboration: Inviting guest speakers from industry or academia can provide students with insights into real-world applications, current trends, and challenges in the field of antennas and propagation. Industry collaborations, such as guest projects or site visits, can further enhance the practical relevance of the course and expose students to professional practices. 7. Online Resources and Discussion Forums: Supplemental online resources, such as readings, videos, and interactive tutorials, can be provided to support student learning. Online discussion forums or platforms can facilitate asynchronous discussions among students, allowing them to share insights, ask questions, and collaborate outside of class time. 8. Formative and Summative Assessments: Regular formative assessments, such as quizzes, homework assignments, and in-class exercises, help monitor student progress and reinforce understanding. Summative assessments, such

	as exams or comprehensive projects, evaluate student learning and achievement of the learning outcomes.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	90	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	6
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	60	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	4
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	150		

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

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Introduction to Antenna and Propagation: Course overview, objectives, and expectations Basic concepts of electromagnetic waves

	Introduction to antennas and their applications, types of antenna
Week 2	Radiation patterns of thin wire antenna Principles of antenna pattern and lobes, radiation intensity, directivity, gain (two dimension and three dimensions)
Week 3	OMNI directional pattern Directional pattern antenna
Week 4	Antenna efficiency, bandwidth, polarization, input impedance, antenna and radiation efficiency, antenna equivalent area, Fraunhofer region and Fresnel region, antenna temperature.
Week 5	Friis transmission equation Radar range equation Antenna Arrays
Week 6	Array configurations and radiation properties Array factors and pattern synthesis Beamforming techniques
Week 7	Reflector antenna-microstrip antenna
Week 8	
Week 9	Electromagnetic wave propagation fundamentals, wave propagation in lossless medium, conductors and dielectric properties, wave propagation in conductor medium, wave propagation in good dielectric medium, wave propagation in good conductor medium.
Week 10	
Week 11	Depth of penetration, surface impedance, reflections and refractions of wave, wave length and phase velocity,
Week 12	
Week 13	Modes of wave propagations, sky wave and tropospheric modes, spectrum of EM wave and applications, ionospheric prorogation, propagation in variable index medium. Fading wave, propagation over plane earth, Freznel zone.
Week 14	
Week 15	**Preparatory week before the final Exam**
Week 16	Final Exam

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Introduction to platform simulator
Week 2	
Week 3	antenna performance indicators (impedance and s-parameters)
Week 4	
Week 5	antenna performance indicators (electromagnetic field and current distribution)
Week 6	
Week 7	Design and simulation of wire antenna
Week 8	
Week 9	Design and simulation aperture antenna
Week 10	
Week 11	Design and simulation of microstrip antenna
Week 12	
Week 13	Design and simulation of antenna array
Week 14	

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Antenna Theory: Analysis and Design, Constantine A. Balanis	Yes
Recommended Texts	Antennas and Wave Propagation, By G. S. N. Raju · 2006	No
Websites	https://www.antenna-theory.com/	

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

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

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

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Microprocessors**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☐ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**MPR322**				
ECTS Credits	**6**				
SWL (hr/sem)	**150**				
Module Level		**UGIII**	**Semester of Delivery**		6
Administering Department		3	**College**		08
Module Leader	Raghda Abd Ul Rab		**e-mail**		ragdaabd301@gmail.com
Module Leader's Acad. Title		Assist. Lecturer	**Module Leader's Qualification**		M.Sc
Module Tutor	Name (if available)		**e-mail**		E-mail
Peer Reviewer Name		Dr. Ayad Mahmood Kwad	**e-mail**		ayad_m_k@yahoo.com
Scientific Committee Approval Date		15/06/2023	**Version Number**		1.0

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	DTC125	**Semester**	2
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	The curriculum of the microprocessor programming course aims to teach the student the basic principles of the 8086 microprocessor and how to program it. Starting with the arithmetic and logic unit and the control unit, then the small storage units and instructions and the way they are implemented inside the microprocessor, and then the input and output units. And then how to program using assembly language and using the instructions of the 8086 processor and how to use it and write integrated programs through the use of the processor board and using an emulator program (emu8086) installed on the computer. The curriculum aims to teach the student how to program the microprocessor and its components and how to benefit from it.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. During the academic year, the student learns the components and properties of the microprocessor. 2. The student learns to program the microprocessor by writing programs in the assembly language, and in the language of the flour. 3. The student learns the uses of the 8086 microprocessor in various applications. 4. Familiarity with the basic concepts of the 8086 microprocessor and its uses. 5. Familiarity with the mathematical relations used in solving microprocessor programs and calculating the time taken to solve and implement different programs. 6. Familiarity with the methods of writing algorithms that help in solving programs for the 8086 processor. 7. Familiarity with developing the student's ability to devise different solutions for programs
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. Part A – Microprocessors Theory Part B – Microprocessors Applications

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	1. Daily discussion to find out the extent of students' comprehension of the material and to develop an evaluation of the daily contributions. 2. Daily quick and short exams to understand the students' comprehension of the material. 3. Giving part of the grade for each chapter for homework. 4. Monthly exams and assessments of the curriculum with a comprehensive final exam for all curriculum items

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	90	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	6
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	60	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	4
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	150		

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

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Introduction to microprocessor systems and Microprocessor architecture
Week 2	Pin diagram and addressing mode
Week 3	Data transfer group
Week 4	Arithmetic instruction and Logical instruction
Week 5	Control instruction and Branch instruction
Week 6	Simple programs and Conditional programs
Week 7	Mid Exam + Advance programs
Week 8	Subroutine programs
Week 9	Introduction to microcontroller technology
Week 10	Microcontroller applications
Week 11	Interrupt to MPU, Interfacing
Week 12	Handshake application in MPU, Delay programming and Timing
Week 13	Support IC chips to MPU
Week 14	Memory design with MP+ Solving advance problem
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	Learn about the system environment and how to use the emulator
Week 2	Simple programs
Week 3	Arithmetic instruction
Week 4	Logical instruction
Week 5	Control instruction
Week 6	Conditional programs

Week 7	Advance programs
Week 8	INT 21h
Week 9	Software interrupt
Week 10	LED using Arduino
Week 11	traffic lights using Arduino
Week 12	
Week 13	Motor
Week 14	

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	•Barry B. Brey, The Intel Microprocessors: Architecture, Programming & Interfacing, PHI, 6th Edition, 2003. •A.K.Ray and K.M. Bhurchandi, Advanced Microprocessor and Peripherals, Tata McGraw Hill	Yes
Recommended Texts	• Neamen, Microelectronics - Circuit Analysis and Design, McGraw-Hill, 2010. • Uffenback, The 8086 Family Design, PHI, 2nd Edition.	No
Websites	Any other materials available on the web	

Grading Scheme
مخطط الدرجات

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

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Communication II**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☐ **Lecture** ☒ **Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**COM323**				
ECTS Credits	**5**				
SWL (hr/sem)	**125**				
Module Level	UGIII		**Semester of Delivery**	6	
Administering Department	Type Dept. Code		**College**	Type College Code	
Module Leader	Qasim Hadi Kareem		**e-mail**	Qasim.hadi2017@gmail.com	
Module Leader's Acad. Title	Lecturer		**Module Leader's Qualification**	Ph.D.	
Module Tutor	Qasim Hadi Kareem		**e-mail**	Qasim.hadi2017@gmail.com	
Peer Reviewer Name	Dr. Malik Abdul Razzaq Jabbar		**e-mail**	maliksaady@yahoo.com	
Scientific Committee Approval Date	15/06/2023		**Version Number**	1.0	

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

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	1. Understanding Communication Systems: The primary aim of the Digital Communication Systems module is to provide students with a comprehensive understanding of communication systems. This includes the fundamental principles and concepts of digital communication, such as encoding, modulation, transmission, reception, and decoding of digital signals. 2. Signal Representation and Transmission: The module aims to familiarize students with different signal representations used in digital communication systems, including binary and multilevel signaling. Students will learn about various modulation techniques, such as amplitude shift keying (ASK), frequency shift keying (FSK), and phase shift keying (PSK), and their applications in transmitting digital signals. 3. Channel Characteristics and Noise: Students will gain an understanding of the characteristics of communication channels and the impact of noise on signal transmission. They will learn how to analyze and evaluate channel impairments, such as attenuation, distortion, and interference, and explore techniques for mitigating the effects of noise, including error detection and correction. 4. Digital Modulation and Demodulation: The module aims to provide students with practical knowledge and skills in digital modulation and demodulation techniques. Students will learn about digital modulation schemes, such as quadrature amplitude modulation (QAM), quadrature phase shift keying (QPSK), and orthogonal frequency division multiplexing (OFDM). They will understand the process of demodulation and signal recovery in digital communication systems. 5. Performance Analysis and Error Control: Students will develop skills in analyzing the performance of digital communication systems. 6. Digital Communication System Design: The module aims to equip students with the ability to design and optimize digital communication systems. Students will learn to assess system requirements, select appropriate modulation schemes, and design system parameters to meet specific performance objectives. 7. Emerging Technologies and Applications: The module aims to expose students to emerging trends and technologies in digital communication systems. Students will explore advanced topics such as spread spectrum techniques, multiple access schemes, and wireless communication.

Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Demonstrate a comprehensive understanding of the fundamental principles and concepts underlying digital communication systems, including signal encoding, modulation, transmission, reception, and decoding. 2. Apply knowledge of signal representation and modulation techniques to design and analyze digital communication systems. Evaluate different modulation schemes, such as ASK, FSK, PSK, and QAM, and select appropriate modulation techniques based on system requirements. 3. Analyze and evaluate the characteristics of communication channels and the impact of noise on signal transmission. Assess channel impairments, including attenuation, distortion, and interference, and propose appropriate mitigation techniques to ensure reliable communication. 4. Demonstrate the ability to demodulate and recover digital signals in a communication system. Apply demodulation techniques to extract the original information from modulated signals, considering factors such as noise, channel effects, and synchronization. 5. Evaluate the performance of digital communication systems using relevant metrics, such as SNR, BER, and bandwidth efficiency. 6. Apply error control techniques including error detection codes, FEC, and interleaving, to enhance the reliability and robustness of digital communication systems. 7. Design and optimize digital communication systems to meet specific performance objectives. Analyze system requirements, select appropriate modulation schemes and parameters, and simulate system performance to validate the design. 8. Demonstrate awareness of emerging trends and technologies in digital communication systems. Identify and discuss advanced topics, such as spread spectrum techniques, multiple access schemes, and wireless communication.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. 1. Introduction to Digital Communication: Overview of digital communication systems and their significance in modern engineering. Comparison of analog and digital communication.

	Introduction to key concepts, such as information theory, channel capacity, and bandwidth. 2. Signal Representation and Encoding: Binary signaling and digital data representation. Pulse amplitude modulation (PAM) and pulse code modulation (PCM). Line coding techniques, including unipolar, polar, bipolar, and Manchester coding. Channel capacity and data rate calculations. 3. Digital Modulation Techniques: Amplitude shift keying (ASK), frequency shift keying (FSK), and phase shift keying (PSK). Quadrature amplitude modulation (QAM) and its variants. Orthogonal frequency division multiplexing (OFDM) and its advantages. Performance evaluation and comparison of modulation schemes. 4. Channel Characteristics and Noise: Channel models and characterization. Signal distortion and equalization techniques. Noise sources and models, including thermal noise and inter-symbol interference (ISI). Signal-to-noise ratio (SNR) and its impact on communication performance. 5. Error Control and Channel Coding: Error detection and correction techniques. Hamming codes, cyclic redundancy check (CRC), and forward error correction (FEC). Convolutional coding and Viterbi decoding. Interleaving and error performance analysis.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	1. Conceptual Understanding: Focus on developing a strong conceptual understanding of digital communication systems. Start by introducing fundamental concepts and theories, such as signal encoding, modulation techniques, channel characteristics, and error control. Use visual aids,

	diagrams, and real-world examples to clarify abstract concepts and promote understanding. 2. Active Learning and Problem-Solving: Incorporate active learning strategies to engage students in the learning process. Encourage participation through discussions, case studies, and problem-solving activities. Present students with real-world scenarios and challenges related to digital communication systems, allowing them to apply their knowledge and critical thinking skills to find solutions. 3. Practical Simulations and Experiments: Utilize computer-aided simulations and practical experiments to enhance understanding and reinforce theoretical concepts. Provide students with access to simulation software or hardware platforms to simulate digital communication systems. Design laboratory experiments to demonstrate the performance of different modulation schemes, error control techniques, and channel characteristics. 4. Industry Guest Lectures and Case Studies: Invite industry professionals to deliver guest lectures or participate in panel discussions to provide insights into real-world applications and challenges in digital communication systems. Share case studies and examples from industry to demonstrate the relevance and practicality of the concepts being taught. 5. Multimedia Resources and Demonstrations: Utilize multimedia resources, such as videos, animations, and interactive online tools, to enhance the learning experience. Demonstrate the operation of digital communication systems through multimedia presentations, showcasing signal encoding, modulation, demodulation, and error control processes. Use visual aids to illustrate complex concepts and engage students. 6. Collaborative Learning and Group Projects: Promote collaborative learning by encouraging group work and peer-to-peer interactions. Assign group projects that require students to design, analyze, and simulate digital communication systems. Provide opportunities for students to work in teams, fostering teamwork, communication, and problem-solving skills. 7. Assessments and Feedback: Use a variety of assessment methods to evaluate students' understanding and progress. Include both individual and group assessments, such as exams, quizzes, project reports, and presentations. Provide timely and constructive feedback to guide students' learning and address any misconceptions or gaps in understanding. 8. Industry Visits and Internships: Arrange visits to relevant industries or organizations that work with digital communication systems. Provide opportunities for students to gain practical exposure through internships or work placements, where they can observe and participate in real-world projects related to digital communication systems. This allows students to bridge the gap between theoretical knowledge and practical application. 9. Resources and References: Provide students with comprehensive resources, including textbooks, research papers, online materials, and references to supplement their learning. Recommend relevant academic and industry publications to keep them updated with the latest

	advancements and research in the field of digital communication systems. 10. Instructor Availability and Support: Make yourself accessible to students for individual consultations, clarification of doubts, and guidance. Offer office hours or online platforms for students to ask questions, discuss concepts, and seek assistance. Provide mentoring and support to students throughout their learning journey.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	76	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	5
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	49	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	3.3
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	125		

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

Delivery Plan (Weekly Syllabus): communication II المنهاج الاسبوعي النظري لمادة الاتصالات 2	
Week No.	**Material Covered**
Week 1	Sampling theorem: concepts of TDM and quantization and determination of quantization error.
Week 2	Sampling theorem: concepts of TDM and quantization and determination of quantization error.
Week 3	Analog to Digital Conversion techniques: PCM and Delta Modulation.
Week 4	Principles of digital communications: Digital Modulation Schemes; ASK, PSK, BPSK, DPSK, and M-ARY communication.
Week 5	Principles of digital communications: Digital Modulation Schemes; ASK, PSK, BPSK, QPSK, QAM, DPSK, and M-ARY communication.
Week 6	Inter-symbol interference and line coding + Mid-term exam
Week 7	
Week 8	Pulse shaping and Matched filter receivers.
Week 9	Pulse shaping and Matched filter receivers.
Week 10	Effect of Gaussian noise on digital communications
Week 11	Optimum receivers for AWGN
Week 12	Optimum threshold detector and calculation of bit error rate.
Week 13	Signals vector representation.
Week 14	Block codes for error detection and error corrections.
Week 15	Preparatory week before the final Exam
Week 16	Final Exam

Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Introduction to digital Communications systems design challenges
Week 2	Requirements for digital Communications systems design
Week 3	Digital Data Transmission: Linear modulation schemes: ASK, PSK, and QAM
Week 4	Digital Data Transmission: Linear modulation schemes: ASK, PSK, and QAM
Week 5	Digital Data Transmission: Linear modulation schemes: ASK, PSK, and QAM
Week 6	Digital Data Transmission: Nonlinear modulation schemes: FSK
Week 7	Digital Data Transmission: Linear modulation schemes with memory: OQPSK
Week 8	Digital Data Transmission: Nonlinear modulation schemes with memory: CPM, CPFSK, and MSK
Week 9	Pulse shaping filters: Rectangular, raised cosine, and root raised cosine
Week 10	Pulse shaping filters: Rectangular, raised cosine, and root raised cosine
Week 11	Digital Data Reception: Optimal detection techniques for optimal linear demodulation: ASK, PSK, and QAM
Week 12	Digital Data Reception: Optimal detection techniques for nonlinear demodulation: FSK
Week 13	Digital Data Reception: Optimal detection techniques for linear demodulation with memory: OQPSK
Week 14	Digital Data Reception: Optimal detection techniques for nonlinear demodulation with memory: CPM, CPFSK, and MSK

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

Required Texts	M. MORRIS MANO / MICHAEL D. CILETTI “DIGITAL DESIGN“5 th Edition 2012	Yes
Recommended Texts	Fundamentals of logic design, 6th edition, Roth, 2010, Thomson learning, Inc.	No
Websites	http://www.electronics-tutorials.ws/combination	

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

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

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Numerical Analysis**			**Module Delivery**	
Module Type	**Basic**			☒**Theory** ☒**Lecture** ☐**Lab** ☐**Tutorial** ☐**Practical** ☐**Seminar**	
Module Code	**NAN324**				
ECTS Credits	**4**				
SWL (hr/sem)	**100**				
Module Level		UGIII	**Semester of Delivery**		6
Administering Department		Type Dept. Code	**College**	Type College Code	
Module Leader	Ruaa Muthana Ali		**e-mail**	ruaaalmusa@gmail.com	
Module Leader's Acad. Title		Lecturer	**Module Leader's Qualification**		Ph.D.
Module Tutor	Name (if available)		**e-mail**	ruaaalmusa@gmail.com	
Peer Reviewer Name		Assist. Prof. Farqad Talib Najim	**e-mail**	farqad_alani@yahoo.com	
Scientific Committee Approval Date		15/06/2023	**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. Teach students various numerical methods for solving nonlinear equations. 2. Provide techniques for numerical differentiation and integration. 3. Enable students to solve 1st order ordinary differential equations numerically. 4. Teach numerical solutions for 2nd order ordinary differential equations. 5. Cover iterative methods for solving linear and nonlinear systems. 6. Teach interpolation techniques for approximating unknown data points. 7. Cover finite difference methods for approximating derivatives and solving differential equations. 8. Teach curve fitting techniques for finding mathematical models that fit data. 9. Cover numerical integration methods such as the trapezoidal rule, Midpoint rule, and Simpson's rule. 10. Introduce complex variable theorem, complex differentiation, and analytic functions, as well as solutions of differential equations by power series, Legendre's equation and polynomials, Bessel functions, gamma and beta functions, for applications in mathematical physics and engineering.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1- Gain a deep understanding of different numerical methods for solving nonlinear equations, enabling the ability to select and apply the most appropriate method for a given problem. 2- Develop proficiency in numerical differentiation and integration techniques, allowing for accurate approximation of derivatives and integrals in various scientific and engineering applications. 3- Acquire the skills to numerically solve 1st order ordinary differential equations, facilitating the analysis and prediction of dynamic systems in fields such as physics, engineering, and economics. 4- Attain the ability to numerically solve 2nd order ordinary differential equations, enabling the modeling and solution of problems involving oscillatory or harmonic motion in diverse disciplines. 5- Master iterative methods for solving linear and nonlinear systems, empowering the ability to efficiently solve systems of equations encountered in electrical engineering, fluid dynamics, optimization, and other domains. 6- Develop proficiency in interpolation techniques, including linear, quadratic, and cubic methods, enabling accurate approximation of unknown data points based on known values in data analysis, signal processing, and computer graphics. 7- Gain expertise in finite difference methods, allowing for the approximation of derivatives and the solution of differential equations

	using discrete points, which is essential in numerical simulations and solving partial differential equations. 8- Develop the capability to apply curve fitting techniques to find mathematical models that best represent a given set of data points, facilitating accurate analysis and prediction in fields such as statistics, machine learning. 9- Acquire proficiency in numerical integration methods such as the trapezoidal rule, Midpoint rule, and Simpson's rule, enabling accurate computation of areas, volumes, and accumulated quantities in diverse scientific and engineering applications. 10- Attain a solid understanding of complex variable theorem, complex differentiation, analytic functions, and their properties, enabling the analysis and manipulation of functions in the complex domain for applications in electromagnetism, fluid dynamics, signal processing, and other fields. Additionally, gain proficiency in solving differential equations by power series, understanding Legendre's equation and polynomials, Bessel functions, and properties of gamma and beta functions, which are fundamental tools in mathematical physics and engineering.
Indicative Contents المحتويات الإرشادية	1- Nonlinear Equations: Iteration, bisection, secant method, and Newton-Raphson methods for solving nonlinear equations. 2- Numerical Differentiation and Integration: Techniques for approximating derivatives and integrals, including forward difference, backward difference, central difference, and various numerical integration methods such as the trapezoidal rule, Midpoint rule, and Simpson's rule. 3- Ordinary Differential Equations: Numerical methods for solving 1st order ordinary differential equations, including Euler's method, Runge-Kutta methods, and higher-order methods like the Adams-Bashforth method. 4- 2nd Order Ordinary Differential Equations: Numerical techniques for solving 2nd order ordinary differential equations, such as the finite difference method, shooting method, and the use of power series and series solutions. 5- Complex Variables: Introduction to complex variable theorem, complex differentiation, analytic functions, properties of analytic functions, integration in the complex plane, Cauchy's theorem, Cauchy's integral formula, and applications of complex analysis in solving problems involving complex functions and contour integrals.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	1- Interactive Lectures: The instructor will deliver engaging lectures that present the theoretical concepts, numerical methods, and their applications. The lectures may include examples, visual aids, and real-world scenarios to enhance understanding and relevance. 2- Problem-solving Sessions: Students will participate in problem-solving sessions where they will apply the numerical methods and techniques learned in lectures to solve practice problems. The instructor will guide and facilitate the process, encouraging active participation and critical thinking. 3- Hands-on Programming: Students will gain practical experience by implementing the numerical methods using programming languages such as Python, MATLAB, or C++. They will write code to execute algorithms and analyze their results, reinforcing their understanding and proficiency in the topic. 4- Group Discussions: Students will engage in group discussions to explore and analyze different approaches to problem-solving. This collaborative learning environment will foster the exchange of ideas, encourage peer-to-peer teaching, and deepen understanding through active engagement with the course material. 5- Numerical Experiments: The instructor may design and conduct numerical experiments to demonstrate the effectiveness and limitations of various numerical methods. Students will actively participate in these experiments, making observations and drawing conclusions, thereby developing a deeper understanding of the underlying principles. 6- Case Studies: The instructor may present real-world case studies where numerical methods and techniques have been applied to solve complex problems in various fields. Students will analyze these case studies, identify the appropriate numerical methods to solve the problems, and discuss the implications of the results. 7- Assessments: Students' learning outcomes will be assessed through a combination of assignments, quizzes, and examinations. These assessments will evaluate their understanding of the theoretical concepts, ability to apply numerical methods to solve problems, and proficiency in programming and analyzing results. Feedback on assessments will be provided to guide students' progress and address any misconceptions.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	46	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	3
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	54	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	3.6
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)	1, 2	LO #1 , 2 and 3
	Assignments	2	10% (10)	3-8	LO # 3, 4 and 5
	Projects / Lab.	1	10% (10)	Continuous	All
	Report	1	10% (10)	9, 10	LO # 6 and 7
Summative assessment	**Midterm Exam**	1 hr	10% (10)	10	LO # 1-7
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus): Numerical Analysis المنهاج الاسبوعي النظري لمادة التحليلات العددية	
	Material Covered
Week 1	Solution of non-linear equation (iteration, bisection, secant method, Newton- Raphson)
Week 2	Numerical differentiation and integration
Week 3	Numerical solution of 1st order ordinary differential equations

Week 4	Numerical solution of 2nd order ordinary differential equations
Week 5	Iterative method for solving linear and -non-linear (Gauss-Seidel and Jacobi Iteration)
Week 6	Interpolation (linear and quadratic, cubic)
Week 7	Finite difference
Week 8	Curve fitting
Week 9	Numerical Integration (trapezoidal rule, Mid – ordeint rule , Simpson rule)
Week 10	Mid Term Exam + Complex Variable Theorem
Week 11	Function of complex variables, complex differentiation, analytic function and its properties
Week 12	Integration in the complex plane, Cauchy's theorem, Cauchy's integral
Week 13	Solution of Differential Equations by Power Series
Week 14	Legendre's equation, Legendre's polynomials, Bessel function of the first and second order kinds. Bessel function properties, Gamma function and Beta function
Week 15	Preparatory week before the final Exam
Week 16	Final Exam

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	E. Kreyszig "Advanced Engineering Mathematics", 10th Edition 2011	No
Recommended Texts	Higher Engineering Mathematics: B. S. Grewal	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 Electrical power**			**Module Delivery**	
Module Type	**Core**			☒**Theory** ☐**Lecture** ☐**Lab** ☒**Tutorial** ☐**Practical** ☐**Seminar**	
Module Code	**POW325**				
ECTS Credits	**6**				
SWL (hr/sem)	**150**				
Module Level	UGIII		**Semester of Delivery**	6	
Administering Department	Type Dept. Code		**College**	Type College Code	
Module Leader	Hiba hadi kurdi AYad Tahseen ABdulhafedh		**e-mail**	Hiba199160@gmail.com ayad.abdulhafedh@aliraqia.edu.iq	
Module Leader's Acad. Title	Asst. lecturer Asst. lecturer		**Module Leader's Qualification**	MSC. MSC.	
Module Tutor	AYad Tahseen ABdulhafedh		**e-mail**	ayad.abdulhafedh@aliraqia.edu.iq	
Peer Reviewer Name	Dr.Bashar Sakeen Farhan Dr.Hussein Jumma Jabir		**e-mail**	Basharfarhan@yahoo.com hjjahmn@gmail.com	
Scientific Committee Approval Date	15/06/2023		**Version Number**	1.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	ACC123	**Semester**	2
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	1. To Introduce Fundamental Concepts: The module aims to provide students with a solid foundation in power systems engineering by introducing them to the fundamental concepts and principles of power systems. Students will develop an understanding of the basic terminology, classifications, and characteristics of power systems. 2. To Develop Mathematical Modeling Skills: Formulate and solve the mathematical models describing physical behavior of generation, transmission and distribution systems. 3. To analyze the basic elements of electrical power transmission and distribution systems such as generators, transmission and distribution lines, and loads. To understand the analytical tools for analysis of basic operations of these systems. 4. To understand the behaviour of the basic components of power systems
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Formulate the mathematical models of generation side of electrical power networks. 2. Describe and define basic concepts and principles of power systems engineering, including the plant types and structure of power systems. 3. Analyze the power systems design, planning and operation. 4. Evaluate the ability of power systems to satisfy the operation requirements. 5. Formulate the mathematical models used in analyzing underground cables. AC and DC distributers in power systems. 6. Describe and define the operational concepts such as: Generation plants, load curve, demand pattern, active & reactive power, voltage profile, HVAC and HVDC transmission lines and distribution operation. 7. Apply critical thinking and problem-solving skills to analyze, design, and evaluate power systems for a variety of applications. 8. Communicate effectively about power systems engineering concepts, both orally and in written form, using appropriate technical terminology and notation. 9. Work effectively as part of a team to solve power systems engineering problems and collaborate on power system design projects.
Indicative Contents المحتويات الإرشادية	Indicative Contents include the following :- **<u>Part A- Generation Units:-</u>** Source of electrical energy- structure of power system, steam, hydroelectric, diesel, nuclear and gas turbine. (6 Hours)

	Part B - Mechanical design of overhead lines:- Main components of overhead lines- conductor materials- line supports- insulators - types of insulators - voltage distribution over suspension insulator-string and string efficiency- Sag in overhead lines- Corona Phenomena - Factor affecting corona-critical disruptive voltage- visual critical voltage- corona losses- Advantages and disadvantages corona effect- Methods of reducing corona effect. (12 Hours) **Part C: - Electrical design of transmission lines.** Overhead transmission lines- electrical design of overhead lines- skin effect - performance of transmission lines, classification of overhead lines (short , medium and long) - voltage regulation and transmission efficiency - generalized constants of transmission lines (A,B ,C, D)- Power circle diagram. (12 Hours) **Part D: - Underground cables** Construction,- classification insulating materials - 3-phase service- laying of underground cables- R &C of single core cables - dielectric stress in a single core cables- grading cables - capacitance grading -inters heath grading - capacitance of three core cables - Types of cable faults. (6 Hours) **Part E: - Power factor improvement** Power triangle- causes of low power factor- power factor improvement equipment (static capacitor, synchronous condenser, phase advancers, FACTs)- importance of power factor improvement- calculations of power factor correction. (6 Hours) **Part F: - Voltage control** Importance- methods -location of voltage control equipment - excitation - Tirril and brown Boveri regulators- tab changing transformer - auto transformer tab changing- booster transformer - induction regulator - voltage controller by synchronous condenser. (6 Hours) **Part G: - generation and distribution factor** Variable load on power station - load and duration curves, maximum demand - demand factor - average load - Diversity factor - Plant capacity factor. (12 Hours) **Part H: - Economic of power generation.** Economic dispatch problem- Thermal system dispatching with network losses consecration- lambda-iteration method- gradient method- Newton method. (12 Hours) **Part I: - Distribution systems,** DC distribution systems- types of DC distributors(one end, both ends, ring, ring with interconnection - 3- wire DC system- AC distribution systems (method of solving AC distribution problems). (12 Hours)

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	❖ Lectures: In-class lectures delivered by the instructor provide the foundational knowledge and theoretical concepts of power systems. Lectures can include explanations, demonstrations, and the presentation of examples to illustrate key concepts. ❖ Interactive Discussions: Encourage active participation and engagement through interactive discussions. This can involve asking questions, facilitating group discussions, and encouraging students to share their insights and perspectives on power systems topics. ❖ Problem-Solving Sessions: Dedicated problem-solving sessions can be conducted where students work on exercises and examples related to power systems. The instructor can guide students through the problem-solving process, addressing any challenges or misconceptions that may arise. ❖ Case Studies and Real-World Applications: Use case studies and real-world applications to demonstrate the relevance and practical implications of power systems. This can involve analyzing power systems and discussing their design, performance, and challenges. ❖ Group Projects: Assign group projects that require students to apply their knowledge of power systems to real or simulated scenarios. This can involve designing and modelling a part of power systems for specific applications, analyzing system performance, and presenting findings to the class. ❖ Computer Simulations: Utilize computer simulations and software tools specifically designed for power systems analysis and design. This allows students to explore system behavior, simulate different power systems operation strategies, and observe the impact of parameter variations. ❖ Guest Speakers: Invite industry professionals or researchers in the field of power systems to share their experiences and insights. Guest speakers can provide real-world perspectives, discuss emerging trends, and inspire students in their learning journey. ❖ Online Resources and Multimedia: Provide access to online resources, textbooks, lecture recordings, and interactive multimedia materials that support the learning of power systems. These resources can serve as supplementary materials for self-study and reinforce understanding. ❖ Formative and Summative Assessments: Incorporate a variety of assessment methods, including quizzes, assignments, lab reports, and examinations, to evaluate students' understanding and progress. Provide constructive feedback to help students improve their knowledge and skills in power systems.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	88	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	6
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	62	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	4
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	150		

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

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
Week	**Material Covered**
Week 1	Generation Units:
Week 2	Mechanical design of overhead lines
Week 3	
Week 4	Electrical design of transmission
Week 5	
Week 6	Underground cables,
Week 7	Power factor improvement,
Week 8	Voltage control
Week 9	Midterm Exam+ Generation and distribution factor
Week 10	

Week 11	Economic of power generation
Week 12	
Week 13	DC and AC distribution systems
Week 14	
Week 15	Preparatory week before the final Exam
Week 16	Final Exam

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	PRINCIPLES OF POWER SYSTEM , V.K. MEHTA ,	Yes
Recommended Texts	POWER GENERATION, OPERATION, AND CONTROL Allen J. Wood and Bruce F, Wollenberg POWER SYSTEM ANALYSIS AND DESIGN, B.R.GUPTA.	Yes
Websites	(169) Solutions Library - YouTube https://www.youtube.com/@solutionslibrary4818/videos	

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks (%)**	**Definition**
Success Group (50 - 100)	**A** - Excellent	امتياز	90 - 100	Outstanding Performance
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	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	**Research Methodology and Academic Writing**			**Module Delivery**	
Module Type	**Support**			☒**Theory** ☐**Lecture** ☐**Lab** ☐**Tutorial** ☐**Practical** ☐**Seminar**	
Module Code	**RMW326**				
ECTS Credits	**3**				
SWL (hr/sem)	**75**				
Module Level		UGIII	**Semester of Delivery**		6
Administering Department		Type Dept. Code	**College**	Type College Code	
Module Leader	Ruaa Muthanna Ali		**e-mail**	ruaaalmusa@gmail.com	
Module Leader's Acad. Title		Lecturer	**Module Leader's Qualification**		Ph.D.
Module Tutor	Name (if available)		**e-mail**	E-mail	
Peer Reviewer Name		Assist. Prof. Baraa Munqith AbdulJabar	**e-mail**	baraaalbaker@aliraqia.edu.iq	
Scientific Committee Approval Date		15/06/2023	**Version Number**		1.0

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

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	1. To develop the student's ability to conduct and in written form report a scientific study in a systematic and transparent manner. 2. To evaluate scientific reports according to relevant methodological principles related to selected paradigms. 3. To emphasis on the importance of a well though-out choice of topic, problematization, and a careful specification of the problem statement ending with an explicit research question that is closely related to the research design. 4. To develop the student's ability to find information in scientific databases, to use different types of information in a critical and an appropriate manner, and to evaluate this information and the sources according to relevant scientific criteria. 5. To focus on the academic writing process and include the fundamental aspects as time planning and how to make dispositions, also questions related to the writing process in order to develop the manuscript through pre-writing activities, drafting, feedback, revision and the wrap-up of the final thesis. 6. To discuss the different genres of styles of writing as well as how models, tables, and figures can drive the writing process forward.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Understand research methodology importance and be capable of generating research ideas. 2. Evaluate the suitability of different research methods to solve different types of research questions. 3. Argue for the formulation of a particular problem (research question), scientific strategies and methodological choices, and analyze an empirical and theoretical material. 4. Use the research tools required to form a research question and hypothesis. 5. Demonstrate the research skills required to undertake a critical literature review. 6. Evaluate appropriate research approaches and strategies to understand literature sources and review process. 7. Design a plan for research project and methods for sampling and data collection based on the possibilities of accessing information. 8. Systemically analyze problems and propose solutions in research methodology and application via research methodology. 9. Perfectly know and use the structure and format of a research report, referencing style, and citation management tools. 10. Have a good and precision understanding in technical writing skills and strategies. 11. Help the students to utilize a presentation of their reasoning in an academically trustworthy and logical manner. 12. Show well-grounded reflections and analytical developments by creating linkages between concepts and transitions in discussions.
Indicative Contents	Introduction to Research Methodology

المحتويات الإرشادية	Epistemology & Ontology(Concept of Construct) Objectives of Research Research Characteristics (Systematic, Valid, Verifiable, Empirical, Critical) Research Methods and Methodology (Qualitative, Quantitative) Research Approaches (Positivism, Interpretive, Feminism) Types of Research Overview of Research Design Exploratory studies -Descriptive studies -Analytical studies- Experimental studies Online Research Method of Data Collection Presentation and Descriptive Analysis of Data Collection of Primary Data- Observation Method- Mail Survey Collection of Data through questionnaire - Case study method Collection of secondary data -Data editing and Data grouping -Content Analysis - Descriptive Statistics Seminar Presentation- Library Interfacing -Bibliography making –Citation- Style Manuals - Footnotes -Reference Management Tools- Writing Research project.

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	32	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	43	**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**	4	20% (20)	Continuous	All
	Report	1	20% (20)	13	LO # 5, 8 and 10
Summative assessment	**Midterm Exam**	1 hr	10% (10)	7	LO # 1-7
	Final Exam	3 hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Introduction to research methodology
Week 2	Types of research methods including analytical, experimental, simulation and empirical methods
Week 3	Research problem identification and research objectives
Week 4	Formulating research questions and hypothesis
Week 5	Literature review and its role in conducting research
Week 6	Sources of literature, review process, and critical analysis of literature **+Mid-term Exam**
Week 7	
Week 8	Research experiments design including planning and designing research projects, sampling techniques, and data collection
Week 9	
Week 10	Quantitative and qualitative data analysis techniques, academic Writing in Engineering and research report writing
Week 11	Structure and format of a research report, referencing style, and citation management tools
Week 12	Technical writing skills and strategies
Week 13	Effective research presentation and oral and poster presentations
Week 14	Case studies and project presentation
Week 15	**Preparatory week before the final Exam**
Week 16	**Final Exam**

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Wayne C. Booth, Gregory G. Colomb, and Joseph M. Williams, The Craft of Research, 2nd edition (Chicago Guides to Writing, Editing, and Publishing), University Of Chicago Press; 1 edition (March 2003)	Yes
Recommended Texts	Angelika H. Hofmann, Scientific Writing and Communication: Papers, Proposals, and Presentations, Oxford University Press, USA (December 16, 2009)	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	**Embedded Systems**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☐ **Lecture** ☐ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**ESY401**				
ECTS Credits	**4**				
SWL (hr/sem)	**100**				
Module Level	UGIV		**Semester of Delivery**	7	
Administering Department	3		**College**	08	
Module Leader	Baraa Munqith AbdulJabar Albaker		**e-mail**	baraaalbaker@aliraqia.edu.iq	
Module Leader's Acad. Title	Assistant Professor		**Module Leader's Qualification**	Ph.D.	
Module Tutor	Name (if available)		**e-mail**	E-mail	
Peer Reviewer Name	Dr.Ayad Mahmood Kwad		**e-mail**	ayad_m_k@yahoo.com	
Scientific Committee Approval Date	15/06/2023		**Version Number**	1.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	DTC125	**Semester**	2
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	1. To introduce students to the fundamental concepts and principles of embedded systems and their applications. 2. To familiarize students with the hardware and architecture of Arduino boards, enabling them to understand microcontrollers and key components. 3. To develop students' programming skills using the Arduino programming language for controlling and interacting with Arduino-based systems. 4. To enable students to interface Arduino with various sensors, actuators, and communication modules to acquire and process data. 5. To provide hands-on experience in developing small-scale projects integrating multiple components and functionalities using Arduino. 6. To enhance problem-solving and communication skills, enabling students to identify and resolve issues and effectively document their work.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Understand the concept, characteristics, and major application areas of embedded systems. 2. Apply the top-down and bottom-up design approaches to develop embedded systems. 3. Design the architecture of embedded systems, considering both hardware and software components. 4. Integrate hardware and software components to create functional embedded systems. 5. Explain different types of processors and controllers used in embedded systems and their architectures. 6. Select appropriate memory types for efficient data storage and retrieval in embedded systems. 7. Utilize sensors, actuators, and other components commonly found in embedded systems. 8. Develop programs for embedded systems using the Arduino programming language. 9. Interface digital and analog devices with an Arduino board for input/output operations. 10. Apply advanced sensor interfacing techniques and control motors using Arduino.

Indicative Contents
المحتويات الإرشادية
	Indicative content includes the following.
	
	1. Introduction to Embedded Systems:
	  ○ Definition and characteristics of embedded systems
	  ○ Overview of their major application areas
	2. Embedded Systems Design Process:
	  ○ Top-Down and Bottom-Up Design approaches
	  ○ Requirement definition and system specification
	  ○ Architecture design

	○ Hardware and software components integration 3. Elements of Embedded Systems: ○ Processors and Controllers: ▪ RISC and CISC architectures ▪ Internal architecture and instruction pipelining ▪ Types of processors: PLD, CPLDs, ASIC, COTS, DSPs, and FPGA ○ Memory: ▪ Flash, PROM, Masked ROM, EPROM, EEPROM, NVRAM ▪ Static and Dynamic RAM ○ Sensors & Actuators and Others: ▪ LED, display, optocouplers, stepper motor, relay, buzzer, switches, keyboard ▪ Brown-out protection circuit, oscillator unit, real-time clock, watchdog timer 4. Introduction to Arduino: ○ Overview of the Arduino platform ○ Arduino board architecture ○ Setting up Arduino IDE 5. Arduino Programming Basics: ○ Introduction to Arduino programming language ○ Variables, data types, functions, and control structures 6. Digital Input/Output Interfacing: ○ Interfacing with digital devices using Arduino ○ Reading digital inputs and controlling digital outputs 7. Analog Input/Output Interfacing: ○ Interfacing with analog sensors and actuators ○ Reading analog inputs using ADC ○ Generating analog outputs using PWM 8. Advanced Sensor Interfacing and Motor Control: ○ Interfacing with advanced sensors ○ Controlling motors using Arduino 9. Project Development: ○ Students work on small-scale projects integrating concepts learned so far

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	To effectively teach the embedded system module based on Arduino, a combination of learning and teaching strategies can be employed. Adopt a hands-on approach by providing students with practical activities and project-based learning opportunities. Encourage collaboration among students through group projects, discussions, and knowledge sharing. Relate the module's content to real-world applications in electrical engineering, showcasing the relevance and practicality of Arduino. Scaffold the learning process by breaking down complex topics into manageable parts, gradually

	building students' knowledge and skills. Employ formative assessment techniques like quizzes, lab exercises, and project checkpoints to provide feedback and monitor student progress. Incorporate active learning strategies such as demonstrations, simulations, and in-class exercises to promote engagement and deeper understanding of the concepts. By combining these strategies, students can actively explore Arduino-based embedded systems, develop problem-solving skills, and apply their knowledge in practical scenarios.

Student Workload (SWL)

الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	46	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	3
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	54	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	3.6
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	100		

Module Evaluation

تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	2	10% (10)	5, 10	LO #1, 2, 10 and 11
	Assignments	2	10% (10)	2, 12	LO # 3, 4, 6 and 7
	Other Activities	1	10% (10)	Continuous	All
	Report	1	10% (10)	13	LO # 5, 8 and 10
Summative assessment	**Midterm Exam**	1 hr	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 Embedded Systems
Week 2	• Major Application Areas of Embedded Systems

Week 3	Embedded Systems Design Process: Top-Down and Bottom-Up Design • Requirement definition and system specification • Architecture design • Hardware and software components and system integration
Week 4	Elements of Embedded Systems: Processors and Controllers • RISC and CISC, • Internal architecture and instruction pipelining, • Types: PLD, CPLDs, ASIC, COTS, DSPs, and FPGA
Week 5	Elements of Embedded Systems: Memory • Flash, PROM, Masked ROM EPROM, EEPROM, NVRAM • Static and Dynamic RAM
Week 6	Elements of Embedded Systems: Sensors & Actuators and Others • LED, display, optocouplers, stepper motor, relay, buzzer, switches, keyboard, Broun-out protection circuit, oscillator unit, real-time clock, and watchdog timer • Midterm Exam
Week 7	Midterm Exam Introduction to Arduino • Overview of Arduino platform • Arduino board architecture Setting up Arduino IDE
Week 8	Arduino Programming Basics • Introduction to Arduino programming language • Variables, data types, functions, and control structures
Week 9	• Digital Input/Output Interfacing
Week 10	• Analogue Input/Output Interfacing
Week 11	• Advanced Sensor Interfacing and Motor Control
Week 12	Project Development • Students work on small-scale projects integrating concepts learned so far
Week 13	• Introduction to Embedded Systems

Week 14	• Major Application Areas of Embedded Systems
Week 15	**Preparatory week before the final Exam**
Week 16	**Final Exam**

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Embedded Systems: Introduction to Arm® Cortex™-M Microcontrollers , Fifth Edition 5th Edition by Jonathan W Valvano	No
Recommended Texts	Designing Embedded Systems with Arduino: A Fundamental Technology for Makers 1st ed. 2018 Edition by Tianhong Pan, Yi Zhu	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	**Power System Analysis**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☐ **Lecture** ☐ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**PSA402**				
ECTS Credits	**4**				
SWL (hr/sem)	**100**				
Module Level	UGIV		**Semester of Delivery**	7	
Administering Department	Type Dept. Code		**College**	Type College Code	
Module Leader	Hiba hadi kurdi AYad Tahseen ABdulhafedh		**e-mail**	hiba199160@gmail.com Adalhadithy@gmail.com	
Module Leader's Acad. Title	Asst. Lecturer		**Module Leader's Qualification**	MSc	
Module Tutor	Name (if available)		**e-mail**	E-mail	
Peer Reviewer Name	Dr.Bashar sakeen Farhan Dr.Hussein Jumma Jabir		**e-mail**	Basharfarhan@yahoo.com hjjahmn@gmail.com	
Scientific Committee Approval Date	15/06/2023		**Version Number**	1.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	POW325	**Semester**	6
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 the representations of power systems and per-unit systems. 2. To analyze the one-line diagram, Impedance and reactance diagram, network matrices, Bus admittance matrix, and solution by nodal equations. 3. To identify Load flow, Data for load flow, Bus bar classifications. 4. To analyze the Power flow equations, Gauss-Siedel method, Newton-raphson method, and fast decoupled method. 5. To demonstrate protection systems, Fuses, Circuit breakers, Protective relays, Protection of alternators and transformers, Protection of bus bars and lines, and Protection against overvoltage. 6. To understand Symmetrical faults and analyze Fault calculations by Thevenin's theorem and Fault calculations using the Z bus. 7. To identify Symmetrical components of unsymmetrical phasors, Sequence impedances of synchronous machines, transmission lines, and transformers. 8. To identify Unsymmetrical faults, Single line to ground fault, Double line to ground faults, Line to line faults, and Fault through an impedance. 9. To understand the stability problem, Power angle curve, Transfer reactance, Swing equation, Steady state stability, and Equal area criterion. 10. To identify the economic Operation Of Power Systems, and to understand Methods Of Loading Turbo-Generators ,economic Scheduling
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Understand the concepts of per-unit systems in power systems. 2. Analyze one-line diagram, Impedance and reactance diagram, network matrices, Bus admittance matrix, and solution by nodal equations. 3. Examine the power flow and evaluate the voltages, active and reactive powers. 4. Explain the principles protection systems, Fuses, Circuit breakers, Protective relays, Protection of alternators and transformers, bus bars and lines, and protection against overvoltage. 5. Investigate the symmetrical fault current and MVA. 6. Draw the Sequence networks (positive, negative, and zero). 7. Calculate Unsymmetrical fault currents and voltages for; Single line to ground fault, Double line to ground faults, Line to line faults, and Faults through an impedance. 8. Investigate the power angle, and solve swing equation. 9. Analyze Steady state stability, and Equal area criterion.
Indicative Contents المحتويات الإرشادية	**<u>Part A- Representations of power systems:-</u>** The one-line diagram, Impedance and reactance diagram, Per unit system, change of base.(3 hours)

	Part B- Power flow analysis:- Network matrices, Bus admittance matrix, solution by nodal equations, Load flow studies, Data for load flow studies, Bus classifications, Power flow equations, Gauss-Siedel method, Newton- raphson method, fast decoupled method, Control of voltage profile. (9 hours) **Part C- Symmetrical faults:-** Transient in RL series circuit, Internal voltages of loaded machines under transient conditions, Fault calculations by Thevenin's theorem, Fault calculations using Z bus. (6 hours) **Part D- Symmetrical components:-** Symmetrical components of unsymmetrical phasors, Power in terms of symmetrical components, Sequence impedances of synchronous machine, Sequence impedances of transmission lines, Sequence impedances of transformers. (3 hours) **Part E-Unsymmetrical faults:-** Single line to ground fault, Double line to ground fault, Line to line fault, Fault through impedance. (6 hours)ز **Part F - Protection systems** Fuses (advantages and disadvantages, fuse element materials, types of fuses), Circuit breakers (classification of circuit breakers, circuit breaker rating) , Protective relays (fundamental requirements of protective relaying, basic relays), Protection of alternators and transformers, Protection of bus bars and lines, Protection against over voltages(causes of over voltages, internal and external) (6 hours) **Part G- Power system stability:-** The stability problem, Power angle curve, Transfer reactance, Swing equation, Inertia constant, Steady state stability, Equal area criterion. (6 hours)

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	1. Lectures: Conduct interactive lectures to introduce and explain the fundamental concepts, theories, and principles of each topic. Use visual aids, examples, and demonstrations to enhance understanding and engagement. 2. Problem-solving Sessions: Organize problem-solving sessions where students can practice solving circuit analysis and design problems related to the module topics. Encourage discussions and collaboration to enhance critical thinking and problem-solving skills. 3. Group Projects: Assign group projects that require students to design and build practical systems. 4. Case Studies: Present real-world case studies where students can analyze and evaluate existing systems, circuits, or devices. Discuss the challenges faced, design considerations, and performance trade-offs. 5. Online Resources: Provide access to online resources, such as textbooks, research papers, video tutorials, and interactive learning platforms, to supplement classroom learning and facilitate self-study. 6. Assessments: Conduct regular quizzes, assignments, and exams to assess students' understanding and progress. Include both theoretical

	and practical components to evaluate their knowledge and application skills. 7. Feedback and Discussions: Provide timely feedback on assignments and assessments, and encourage students to engage in discussions, asking questions, and seeking clarification on concepts that may be challenging.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	46	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	3
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	54	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	3.6
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	100		

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

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Representations of power systems.
Week 2	Load flow studies and Control of voltage profile.
Week 3	
Week 4	
Week 5	
Week 5	Symmetrical faults
Week 6	
Week 7	Mid-term Exam + Symmetrical components
Week 8	
Week 9	Unsymmetrical faults
Week 10	
Week 11	Protection systems
Week 12	
Week 13	Power system stability
Week 14	
Week 15	Preparatory week before the final Exam
Week 16	final Exam

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	POWER SYSTEM ANALYSIS AND DESIGN , B.R.GUPTA	Yes
Recommended Texts	Power System Analysis by John Grainger William Stevenson	Yes
Websites	(177) Power System Analysis - YouTube https://www.youtube.com/@powersystemanalysis1813	

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	**Control Systems I**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☐ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**CNT403**				
ECTS Credits	**6**				
SWL (hr/sem)	**150**				
Module Level		**UGIV**	**Semester of Delivery**		7
Administering Department		3	**College**		08
Module Leader	Ayad Mahmood Kwad		**e-mail**		ayad_m_k@yahoo.com
Module Leader's Acad. Title		Lecturer	**Module Leader's Qualification**		Ph.D.
Module Tutor	Name (if available)		**e-mail**		E-mail
Peer Reviewer Name		Dr.Khalid J. Kazim	**e-mail**		khalid.j.kazim@gmail.com
Scientific Committee Approval Date		15/06/2023	**Version Number**		1.0

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	NAS203	**Semester**	3
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 Introduce Fundamental Concepts: The module aims to provide students with a solid foundation in control systems engineering by introducing them to the fundamental concepts and principles of control systems. Students will develop an understanding of the basic terminology, classifications, and characteristics of control systems. 2. To Develop Mathematical Modeling Skills: The module aims to develop students' skills in mathematical modeling of dynamic systems. Students will learn how to represent physical systems using differential equations, transfer functions, and state-space models. They will gain proficiency in transforming systems between different representations. 3. To Analyze Time-Domain Response: The module aims to enable students to analyze the time-domain response of control systems. Students will learn to analyze and interpret the transient and steady-state behavior of control systems, including performance metrics such as rise time, settling time, overshoot, and steady-state error. They will develop an understanding of the relationship between system parameters and response characteristics. 4. To Understand Stability Analysis: The module aims to familiarize students with stability analysis techniques for control systems. Students will learn the Routh-Hurwitz stability criterion and how to apply it to determine the stability of linear systems. They will also gain an understanding of the root locus method and its application in analyzing and designing control systems.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Describe the basic concepts and principles of control systems engineering, including the differences between open-loop and closed-loop control systems. 2. Apply mathematical modeling techniques to represent dynamic systems using differential equations, transfer functions, and state-space models. 3. Analyze the time-domain response of control systems, including the ability to calculate performance metrics such as rise time, settling time, overshoot, and steady-state error. 4. Evaluate the stability of linear control systems using the Routh-Hurwitz stability criterion and root locus analysis. 5. Apply critical thinking and problem-solving skills to analyze, design, and evaluate control systems for a variety of applications. 6. Communicate effectively about control systems engineering concepts, both orally and in written form, using appropriate technical terminology and notation. 7. Work effectively as part of a team to solve control systems engineering problems and collaborate on control system design projects.
Indicative Contents المحتويات الإرشادية	❖ Introduction to Control Systems: Definition and classification of control systems. Block diagrams and signal flow graphs.

	Open-loop and closed-loop control systems. Feedback and its importance in control systems. ❖ Mathematical Modeling of Dynamic Systems: Differential equations and their application to control systems. Transfer function representation of linear time-invariant (LTI) systems. State-space representation of control systems. Linearization of nonlinear systems. ❖ Time-Domain Analysis: Time response analysis (steady-state and transient response). Performance metrics: rise time, settling time, overshoot, and steady-state error. Stability analysis using Routh-Hurwitz criteria. Root locus analysis for pole placement.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	❖ Lectures: In-class lectures delivered by the instructor provide the foundational knowledge and theoretical concepts of control systems. Lectures can include explanations, demonstrations, and the presentation of examples to illustrate key concepts. ❖ Interactive Discussions: Encourage active participation and engagement through interactive discussions. This can involve asking questions, facilitating group discussions, and encouraging students to share their insights and perspectives on control systems topics. ❖ Problem-Solving Sessions: Dedicated problem-solving sessions can be conducted where students work on exercises and examples related to control systems. The instructor can guide students through the problem-solving process, addressing any challenges or misconceptions that may arise. ❖ Laboratory Work: Hands-on laboratory sessions provide practical experience in implementing control systems and validating theoretical concepts. Students can work with hardware and software tools to design, simulate, and analyze control systems. ❖ Case Studies and Real-World Applications: Use case studies and real-world applications to demonstrate the relevance and practical implications of control systems. This can involve analyzing control systems used in various industries and discussing their design, performance, and challenges. ❖ Group Projects: Assign group projects that require students to apply their knowledge of control systems to real or simulated scenarios. This can involve designing and implementing control systems for specific applications, analyzing system performance, and presenting findings to the class. ❖ Computer Simulations: Utilize computer simulations and software tools specifically designed for control systems analysis and design. This allows students

	to explore system behavior, simulate different control strategies, and observe the impact of parameter variations. ❖ Guest Speakers: Invite industry professionals or researchers in the field of control systems to share their experiences and insights. Guest speakers can provide real-world perspectives, discuss emerging trends, and inspire students in their learning journey. ❖ Online Resources and Multimedia: Provide access to online resources, textbooks, lecture recordings, and interactive multimedia materials that support the learning of control systems. These resources can serve as supplementary materials for self-study and reinforce understanding. ❖ Formative and Summative Assessments: Incorporate a variety of assessment methods, including quizzes, assignments, lab reports, and examinations, to evaluate students' understanding and progress. Provide constructive feedback to help students improve their knowledge and skills in control systems.

Student Workload (SWL)

الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	90	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	6
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	60	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	4
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	150		

Module Evaluation

تقييم المادة الدراسية

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

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Introduction to Control Systems: Overview of control systems Open-loop and closed-loop systems.
Week 2 **Week 3** **Week 4**	Mathematical Modeling of Dynamic Systems: Differential equations, Laplace for differential equation, and transfer function representation for various systems (electrical, mechanical, and electromechanical systems) Matrix model representation
Week 5 **Week 6** **Week 7**	System representation: Important definitions Techniques of simplifying block diagrams Signal flow graphs Changing block diagrams to signal flow graphs and vice versa. Mason's rule + Midterm Exam
Week 8 **Week 9** **Week 10**	Time-Domain Analysis Time response analysis Performance metrics and specifications Stability analysis using Routh-Hurwitz criteria
Week 11 **Week 12** **Week 13** **Week 14**	Root Locus Analysis Root locus plotting for negative feedback systems. Dominant poles determination for various systems with various orders
Week 15	**Preparatory week before the final Exam**
Week 16	**Final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1 **Week 2**	Introduction to Control System Toolbox in MATLAB
Week 3 **Week 4**	Transfer Function Models
Week 5	

Week 6	System Characteristics and Transient Response Analysis
Week 7	Modeling of Physical Systems
Week 8	
Week 9	State Space Model of Transfer Function Using MATLAB
Week 10	
Week 11	Pole placement through state feedback
Week 12	
Week 13	Using MATLAB and GUI based SISO Tool for Root Locus
Week 14	

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Control Systems Engineering, 7th Edition by Norman S. Nise	No
Recommended Texts	Modern Control Engineering 5th Edition by Katsuhiko Ogata	Yes
Websites	http://ayadmk.blogspot.com/p/control-systems-engineering.html	

Grading Scheme
مخطط الدرجات

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

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

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Power Electronics**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☐ **L Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**PWE404**				
ECTS Credits	**6.00**				
SWL (hr/sem)	**150**				
Module Level	1		**Semester of Delivery**	7	
Administering Department	Type Dept. Code		**College**	Type College Code	
Module Leader	Bashar Sakeen Farhan		**e-mail**	Basharfarhan@yahoo.com	
Module Leader's Acad. Title	Lecturer		**Module Leader's Qualification**	Ph.D.	
Module Tutor	Name (if available)		**e-mail**	E-mail	
Peer Reviewer Name	Assist. Prof. Baraa M. Albaker		**e-mail**	baraamalbaker@ymail.com	
Scientific Committee Approval Date	15/06/2023		**Version Number**	1.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	ELE202	**Semester**	3
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	1. To Identify the types of power semiconductor switches. 2. To Analysis electrical properties of different types of DC-DC converters 3. To Identify the types and characteristics of the Inverters. 4. To Design and implement Maximum Power Point Tracking system of PV System based on P&O and INC algorithms. 5. To Identify the types and characteristics of the Electric Drives.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1- Familiarize the student with the principles of high-capacity electronic switches 2- The student will be able to simulate the electric rectifier with different load types 3- The student will be able to Design and implementation the DC-DC converters 4- Familiarize the student with the characteristics and method of the AC-AC converters and how to simulate it 5- Familiarize the student with the characteristics and method of the inverters converters and how to simulate it 6- The student will be able to Design and implementation Maximum Point Tracking Method of Photovoltaic System based on P&O and INC algorithms 7- Familiarize the student with the characteristics and method of the Electric Drives converters and how to control it
Indicative Contents المحتويات الإرشادية	Part A – Introduction and Power Electronic switches Concept of power electronics, application of power electronics, Power diodes, Its characteristics, types. Power transistors, Power mosfets, characteristics, comparison with BJT. IGBT, characteristics. Thyristors, V-I characteristics and applications. SCR turn on methods. Switching characteristics of thyristor, Two transistor model of SCR. Series and parallel operation of thyristor, Gate triggering circuits of thyristor. Losses and cooling [8 hrs] Part B – Rectifiers Principle of operation of single phase half wave and full wave uncontrolled rectifiers with R, RL and RLE load with /without capacitor filter, effects of freewheeling diodes. Principle of operation of three phase half wave and full wave uncontrolled rectifiers with R, RL Principle of operation of single phase half wave and full wave controlled rectifiers with R, RL and RLE load with /without capacitor filter, effects of freewheeling diodes. Principle of operation of three phase half wave and full wave controlled rectifiers with R, RL, effects of freewheeling diodes. harmonics analysis of Uncontrolled and full controlled rectifiers. Effects of source inductance on the performance of converters. [12 hrs] Part C – AC-AC Conversion Principle of on-off and phase control. Single phase and three phase controllers with R and R-L loads.

	Principle of operation of cycloconverters, single phase to single phase step up and step down cycloconverters, circulating and non-circulating mode of operation. Three phase to single phase Cycloconverters, three phase to three phase Cycloconverter. [8 hrs] <u>Part D – DC-DC Conversion</u> Linear Voltage Regulators, A Basic Switching Converter, The Buck (Step-Down) Converter, The Boost Converter, The Buck-Boost Converter, The ´Cuk Converter, Class-B chopper, Class-C chopper, Class-D chopper, Class-E chopper [6 hrs] <u>Part E Inverters</u> Definition, classification of inverters based on nature of input source, wave shape of output voltage, method of commutation & connections. Principle of operation of single phase bridge inverter with R and R-L loads Principle of operation of three phase bridge inverter with R and R-L loads Principle of operation of single phase PWM inverter with R and R-L loads Principle of operation of three phase PWM inverter with R and R-L loads Methods of voltage control and harmonic reduction of inverters. [8 hrs] <u>Part F Solar Photovoltaic System</u> Photovoltaic (PV) cell , maximum power point tracking (MPPT) methods, Perturb and observe (PPO) method DC-DC converters (Boost and buck converter) , photovoltaic inverters (types, characteristics and operation), CONTROLLED SINGLE-PHASE and three phase converter operating as an inverter [6 hrs] <u>Part G Speed control of DC and AC motors.</u> Ratings of Motors: Rating of the Motor for Continuous Load, Intermittent Loads, and Variable Load. DC Chopper Drives: One-Quadrant DC Chopper Drives, Analytical Properties of the Armature Current Waveform, Power Input, Supply Current, Average Armature Current and Torque Calculations. DC Drives Using Controlled Rectifiers: Introduction, Single-Phase Converter Drives, Three-Phase DC Drives AC Drives: Speed Control of Induction Motor, Synchronous Motor Drives. [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	90	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	6
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	60	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	4
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**150**		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	2	10% (10)	11 and 15	LO #5- #7
	Assignments	2	10% (10)	10 and 14	LO #5 and #7
	Projects / Lab.	1	10% (10)	Continuous	All
	Report	1	10% (10)	13	LO #6
Summative assessment	**Midterm Exam**	2hr	10% (10)	8	LO #1 - #4
	Final Exam	4hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Introduction
Week 2	Power Electronic switches
Week 3	Rectifiers
Week 4	
Week 5	
Week 6	

Week 7	AC-AC CONVERSION
Week 8	Midterm Exam + DC-DC Converters: DC chopper
Week 9	
Week 10	Inverters
Week 11	
Week 12	Solar Photovoltaic System Speed control of DC and AC motors.
Week 13	
Week 14	
Week 15	**Preparatory week before the final Exam**
Week 16	**Final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Review of Matlab - Simulink
Week 2	
Week 3	Half and Full wave Uncontrolled Single Phase rectifier with R Load , R L load and C filter
Week 4	
Week 5	Half and Full wave Uncontrolled Three Phase rectifier with R load, R L and C filter
Week 6	
Week 7	Total Harmonics Distortion Analysis of : Half and Full wave Uncontrolled –Controlled Single Phase rectifier
Week 8	Total Harmonics Distortion Analysis of : Half and Full wave Uncontrolled-Controlled Three Phase rectifier with R L load
Week 9	SINGLE-PHASE AC VOLTAGE CONTROLLER with R Load
Week 10	DC To DC Converter : Buck Converter
Week 11	DC To DC Converter : Boost Converter,
Week 12	Buck-Boost Converter
Week 13	Single phase Square-Wave Inverter
Week 14	PWM Single phase Inverter

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Power Electronics by DanielW. Hart Power Electronics and Drives by Mohammed T. Lazim Al-Zuhairi	No
Recommended Texts		
Websites		

Grading Scheme
مخطط الدرجات

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

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

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Digital Electronics**			**Module Delivery**	
Module Type	**Core**			☒**Theory** ☐**Lecture** ☐**Lab** ☒**Tutorial** ☐**Practical** ☐**Seminar**	
Module Code	**DEL405**				
ECTS Credits	**5**				
SWL (hr/sem)	**125**				
Module Level		UGIV	**Semester of Delivery**		7
Administering Department			**College**		
Module Leader	Mohammed Nasser Hussain		**e-mail**	Mohammed_alturfi@yahoo.com	
Module Leader's Acad. Title		Prof.	**Module Leader's Qualification**		Ph.D.
Module Tutor	Mohammed Nasser Hussain		**e-mail**	Mohammed_alturfi@yahoo.com	
Peer Reviewer Name		Assist. Prof. Baraa Munqith AbdulJabar	**e-mail**	baraaalbaker@aliraqia.edu.iq	
Scientific Committee Approval Date		15/06/2023	**Version Number**		1.0

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	DTC125	**Semester**	2
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	1. **To study the principles and techniques of digital electronics** 2. **To study the digital circuits analysis schemes and how they can they effect the circuit design.** 3. **study the influencing parameters that must be taken under consideration while finishing the circuit design To understand** 4. **Calculating the optimal values for the circuit components to guarantee optimal solutions.** 5. **Designing and updating different types of digital circuits solutions depending upon the environmental - practical and applicable realistic conditions.** 6. **Updating analysis methods for the inputs in order to make the outputs more compatible with the system environmental needs**
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. **The student acquires the principals of digital electronics.** 2. **The student learn the techniques, ways, and properties of Digital designs .** 3. **The student must study methods for problem formulation and analyzing to reach feasible solutions .** 4. **To study multiple methods for digital circuits design and implementation according to the type of the digital input signal .** 5. **To identify the strength and weak points in the circuit design using the available digital electronic circuit design software's like electronic work bench .** 6. **Updating and upgrading the main circuit designs to obtain new circuit applications depending on the market demands .** 7. **To enforce the student to dig for appropriate solutions for electronic circuits in general and digital electronic in particular** 8. **To develop the engineering sense about signal generations and applications.** 9. **Full and complete searching and planning to find optimal solutions for realistic problems within the availability tools and software's.** 10. **To study the frequency synthesizing .** 11. **To control the signal propagation through the media channel by using the exact type of filters.** 12. **To design the internal and the external architecture of different memory types of RAM and ROM** 13. **To understand memory operations and timing diagrams including read and, write** 14. **To implement a function using Programmable read only memory, Programmable logic array, and Programmable array logic**
Indicative Contents المحتويات الإرشادية	**Indicative content includes the following.** **<u>Part A - Timing Circuits</u>** **explaine the Timing Circuits, 555timer, Multivibrators:- Astable, Monostable, Bistable electronic circuits design and operation and including their different types with demonstrative examples [12 hrs].** **Followed by ADC and DAC circuits, implementation, Characteristics, and operation with some applications [8 hrs].** **To be followed by Sequence circuits, Sequence Generators, Shift registers, principles**

	of operation and design with Applications to arrange the system outcomes for understanding the second part of the course which consists of state machines [8 hrs]. **Part B - State machine Designs** **1) Finite State Machine (FSM)** **In this section of the part, Finite State Machine are demonstrated, Mealy & Moore Approaches with analyzing, operating, designing, and applying with system debugging, system limiting and design protection. [12 hrs.]** **2) Algorithmic State Machine (ASM)** **In order to overcome the system limitation in the first section there must be a strategy to gurantee the system simplicity with best system performance with minimal cost to hold larger number of system inputs and outputs [8 hrs.]** **3) Semiconductors memories: design the internal and the external architecture of different memory types of RAM and ROM. Programmable read only memory, Programmable logic array, and Programmable array logic. [8 hrs.2]**

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	**1-The lecture attendance in the classroom to rise the interaction to achieve brain storming.** **2- Electronic lectures using Google meet, FCC, Zoom** **3- Vedio lectures, workshops, and meetings for discussion** **4- Assignments and small projects implementation** **5- Reports and studies** **6- Using demonstration tools side by side with uploading the videos and papered lectures on Google classroom as homeworks** **7- Opening the direct and indirect interactive discussions between the teacher and the students and the students them selves**

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	60	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	65	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	4.3
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	125		

Module Evaluation تقييم المادة الدراسية				
	Time/Nu	**Weight (Marks)**	**Week Due**	**Relevant Learning**

		mber			Outcome
Formative assessment	Quizzes	2	10% (10)	4 and 14	LO #1-#3 and LO8#-11#
	Assignments	1	10% (10)	6	LO#4-#6
	Projects Presentation	1	10% (10)	10	LO #6-#8
	Report	1	10% (10)	13	LO#12-#14
Summative assessment	Midterm Exam	1 hr	10% (10)	1-7	LO#1-#10
	Final Exam	3hr	50% (50)		All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Timing Circuits, 555timer, Multivibrators:- Astable, Monostable, Bistable electronic circuits design and operation
Week 2	
Week 3	
Week 4	ADC & DAC
Week 5	
Week 6	Sequence circuits, Sequence Generators, Shift registers, principles of operation and design with Applications
Week 7	
Week 8	Finite State Machine, Mealy & Moore with analyzing, operating, designing, and applying with system debugging + Midterm Exam
Week 9	
Week 10	
Week 11	Algorithmic State Machine (ASM)
Week 12	
Week 13	Semiconductors memories
Week 14	
Week 15	Preparatory week before the final Exam
Week 16	Final Exam

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	Available in the Library?
Required Texts	Fundamentals of Electronic Circuits, C.K. Alexander and M.N.O Sadiku, McGraw-Hill Education	Yes
Recommended Texts	1. S.S.Bhatti & Rahul Malhotra, " A text book of Digital Electronics", 29 NOV. 2011 2. Natarajan & Dhanasekharan, "Fundamentals of Digital Electronics", 2014 .	Yes
Websites	https://www.coursera.org/browse/Digital Electronics-and-engineering/electrical-engineering	

Grading Scheme مخطط الدرجات				
Group	Grade	التقدير	Marks	Definition

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

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

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Digital Signal Processing**			**Module Delivery**	
Module Type	**Core**			☒**Theory** ☐**Lecture** ☐**Lab** ☒**Tutorial** ☐**Practical** ☐**Seminar**	
Module Code	**DSP421**				
ECTS Credits	**5**				
SWL (hr/sem)	**125**				
Module Level		**UGIV**	**Semester of Delivery**		8
Administering Department			**College**		
Module Leader	Mohammed Nasser Hussain		**e-mail**	Mohammed_alturfi@yahoo.com	
Module Leader's Acad. Title		Prof.	**Module Leader's Qualification**		Ph.D.
Module Tutor	Mohammed Nasser Hussain		**e-mail**	Mohammed_alturfi@yahoo.com	
Peer Reviewer Name		Asst. Prof. Baraa Munqith Albaker	**e-mail**	baraaalbaker@aliraqia.edu.iq	
Scientific Committee Approval Date		15/06/2023	**Version Number**	1.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	EAN301	**Semester**	3
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 study the principles and techniques of digital Signal Processing.** 2. **To study the digital circuits and networks analysis schemes and how they can affect the circuit design.** 3. **To study the influencing parameters that must be taken under consideration while making digital transforms.** 4. **Calculating the optimal values for different transforms to guarantee optimal solutions.** 5. **Designing and updating different types of digital circuit and filter solutions depending upon the environmental - practical and applicable realistic conditions.** 6. **Updating analysis methods for the inputs in order to make the outputs more compatible with the system environmental needs**
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	**1. The student acquires the principals of digital signal processing** **2.The student learn the techniques, ways, and properties of Digital Transformations** **3.The student must study methods for problem formulation and analyzing to reach feasible solutions** **4.To study multiple methods for digital and analog circuits design and implementation according to the type of the digital or analog input signal** **5.To identify the strength and weak points in the circuit design using the available digital signal processing tools & designing software's like Matlab** **A6 .Updating and upgrading the main circuit and filter designs to obtain new circuit applications depending on the market demands** **7.To enforce the student to dig for appropriate solutions for signals & circuits in general and digital signal processing and filters in particular** **8.To develop the engineering sense about signal generations and applications** **9.Full and complete searching and planning to find optimal solutions for realistic problems within the availability tools and software's** **10.To study the frequency synthesizing** **11.To control the signal propagation through the media channel by using the exact type of filters**
Indicative Contents المحتويات الإرشادية	**Indicative content includes the following.** **Part A - Discrete system parts and analysis** **Introduction to Discrete systems and Types, Discrete signals, Types of Discrete Systems and System Impulse response Evaluation and system stability . [6 hrs]** **Time analysis starts with Convolution and Correlation. [3 hrs]** **While frequency analysis consists of Frequency Analysis and Specifications, Fourier Series and Transforms, Laplace Transforms Applications and Transfer function with system stability, and DFT & FFT. [12 hrs]** **Part B -Filter analysis and Designs** **This part consists of two major approaches for analog filter designs:-** **1) Filter Analysis and design [Butterwort Analog Filters (LPF+HPF+BPF+BSF)]** **2) Filter Analysis and design [Chebu-Chev Analog Filters (LPF+HPF+BPF.+BSF)]** **While Digital filter designs consists of:-** **1) FIR and IIR Digital Filter realization** **2) A) Bi-Linear Transformation B) analog filter specifications C) Digital filter specifications. [15 hrs]** **Part c - Multi-Resolution Analysis** **This part consists of three major sections as follow:-** **1) State Space Representation and Matrix Manipulation [3 hrs]** **2) Multi-Resolution Analysis [3 hrs]** **3) Wavelet Transform & Wavelet Packet Transform. [3 hrs]**

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	**1-The lecture attendance in the classroom to rise the interaction to achieve brain storming.** **2- Electronic lectures using Google meet, FCC, Zoom** **3- Vedio lectures, workshops, and meetings for discussion** **4- Assignments and small projects implementation** **5- Reports and studies** **6- Using demonstration tools side by side with uploading the videos and papered lectures on Google classroom as homeworks** **7- Opening the direct and indirect interactive discussions between the teacher and the students and the students them selves**

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	60	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	65	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	4.3
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	125		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	4	20% (20)	4 ,7,10and 14	LO#1-#4 ,LO#5-#6,LO#7-#10and LO#11
	Assignments	1	10% (10)	15	LO# 5- #7
	Report	1	10% (10)	15	LO #9-#12
Summative assessment	**Midterm Exam**	1 hr	10% (10)	8	LO#1-#5
	Final Exam	3hr	50% (50)	15	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري

	Material Covered
Week 1	**Introduction to Discrete systems and Types, Discrete signals and Types**
Week 2	**System Impulse response Evaluation**
Week 3	**Convolution and Correlation**
Week 4	**Frequency Analysis and Specifications**
Week 5	**Fourier Series and Transforms**
Week 6	**DFT & FFT**
Week 7	**Laplace Transforms Applications and Transfer function with system stability**
Week 8	**Filter Analysis and design [Butterwort Analog Filters (LPF+HPF+BPF.+BSF)]+Mid Exam**
Week 9	**Filter Analysis and design [Chebu-Chev Analog Filters (LPF+HPF+BPF+BSF)]**
Week 10	**FIR and IIR Digital Filter realization**
Week 11	**A) Bi-Linear Transformation B) analog filter specifications C) Digital filter specifications**
Week 12	**Digital filters realization using State Space Representation and Matrix Manipulation**
Week 13	**Multi-Resolution Analysis**
Week 14	**Wavelet Transform & Wavelet Packet Transform**
Week 15	**Preparatory week before the final Exam**
Week 16	**Final Exam**

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	**[1] Digital Signal Processing: A Computer-Based Approach, S. K. Mitra, McGraw-Hill, Third edition, 2006.**	**Yes**
Recommended Texts	**[1] The Student Edition of MATLAB, Prentice-Hall, New Jersey. [2] Supplementary class notes, available over the USC Distance Education Network**	**Yes**
Websites	**https://www.coursera.org/browse/DSP-and-engineering/electrical-engineering**	

Grading Scheme

مخطط الدرجات

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

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

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Renewable energy and smart grid**			**Module Delivery**	
Module Type	**Core**			☒**Theory** ☐**Lecture** ☒**Lab** ☐**Tutorial** ☐**Practical** ☐**Seminar**	
Module Code	**RSG422**				
ECTS Credits	**5**				
SWL (hr/sem)	**125**				
Module Level		**UGIV**	**Semester of Delivery**		8
Administering Department		Type Dept. Code	**College**	Type College Code	
Module Leader	Ahmed naji zaidan		**e-mail**	ahmed87m88@gmail.com	
Module Leader's Acad. Title		Ass. Lecturer	**Module Leader's Qualification**		Msc.
Module Tutor	Name (if available)		**e-mail**	E-mail	
Peer Reviewer Name		Dr.Bashar sakeen Dr.Hussein Jumma Jabir	**e-mail**	Basharfarhan@yahoo.com hjjahmn@gmail.com	
Scientific Committee Approval Date		15/06/2023	**Version Number**	1.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	ACC123	**Semester**	2
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	1. To Introduce Fundamental Concepts: Introduction to the basic concepts of power systems along with the inherent elements of computational intelligence, communication technology and decision support system. The module aims to provide students with a solid foundation in renewable energy and smart grid systems engineering by introducing them to the fundamental concepts and principles of smart grid. Students will develop an understanding of the basic terminology, classifications, and characteristics of smart grid. 2. To Develop Mathematical Modeling Skills: Formulate and solve the mathematical models describing physical behavior of generation, transmission and distribution systems in presence of smart grid. 3. To analyze the basic elements of smart grid. To understand the analytical tools for analysis of basic operations of this system. 4. To understand the behaviour of the basic components of smart grid. To provide students with a working knowledge of fundamentals, design, analysis, and development of Smart Grid, from the basic concepts of power systems to the inherent elements of computational intelligence, communication technology and decision support system. The automation and computational techniques needed to ensure that the Smart Grid guarantees adaptability and capability of handling new systems and components are discussed. Power flow analysis and optimization schemes needed for the generation, transmission, distribution, demand response, and reconfiguration is explained in detail and simulation tools such as Matlab is used. 5. Students will understand fundamental principles, generalizations, operations, and economies of smart power grids. 6. Students will learn factual knowledge (terminology, classifications, methods) of cyber-physical systems 7. Students will analyze the issues with the transition towards the smart grids and evaluate and propose solutions for smart power grids. 8. Understand the concept of smart grid technologies and their application to existing and modern power systems. 9. Understand the benefits and limitations of grid connected systems in existing and modern power systems. 10. Recognize and experience practical and theoretical techniques that are used to evaluate and compare smart grid technologies and grid connected systems.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Describe the background motivation for the adoption of smart grid technologies with reference to the financial, reliability and environmental landscape. 2. Discuss the fundamental terminology used to describe smart grid systems. 3. Illustrate the challenges and possibilities brought by smart grid systems.

	4. Distinguish between methods for operating the smart grid and optimizing smart grid functions. 5. Analyze the application of information and communication technology to smart grid applications. 6. Apply their knowledge of the technology types needed for microgrids, integration of renewable energy and energy storage to power system design and operation. 7. Describe the role of uncertainty analysis in the modelling and simulation of energy systems. 8. Demonstrate the use of methods that predict the performance of smart gird technologies and grid connected systems, in terms of cost, reliability and environmental impact. 9. Demonstrate the use of hardware-in-the loop testing of a smart grid system controller.
Indicative Contents المحتويات الإرشادية	**Part A - Renewable energy:-** Solar energy, wind energy, hydropower and fuel cell; effect of electric vehicles (EVs). Energy Storage Systems (ESS), Elements of distributed energy resources (DER) and grid integration. (4 hours) **Part B - smart grid:-** Introduction to smart grid, power grid operation, intelligent distribution networks, Smart distribution networks versus conventional distribution networks. (2 hours) **Part C- Energy Management in smart grids:-** Demand Side Management, Demand Response and Demand Pricing , Energy generation scheduling in smart grids. (4 hours) **Part D- Smart Meters :-** Smart Grid Standards (2 hours) **Part E- Networks and Security:-** IT Networks and Security & Telecommunication Systems in Smart Grids, Network Architectures, Power Line Communications, Advanced Metering Infrastructure, Sensor Technologies , zigbee, GSM, and more; machine to-machine communication models for the smart grid; Home area networks (HAN) and neighborhood area networks (NAN); reliability, redundancy and security aspects. (4 hours) **Part F- power grid and measurement :-** Elements of the power grid and measurement technologies: generation, transmission, distribution, and end-user; Basic concepts of power, load models, load flow analysis; Wide area monitoring system (WAMS), advanced metering infrastructure (AMI), and phasor measurement units (PMU); Locating and sizing storage. (4 hours)

	<u>Part G- Optimization and Distributed Control</u> Introduction to Optimization and Distributed Control. Elements of computation and decision support tools: classical optimization methods, evolutionary computational techniques (particle swarm optimization), Renewable Energy Integration in Smart Grids. (4 hours) **<u>Part H- Economic drives :-</u>** Economic drives of the smart grid; project Presentations. (4 hours)

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	❖ Lectures: In-class lectures delivered by the instructor provide the foundational knowledge and theoretical concepts of smart grids. Lectures can include explanations, demonstrations, and the presentation of examples to illustrate key concepts. ❖ Interactive Discussions: Encourage active participation and engagement through interactive discussions. This can involve asking questions, facilitating group discussions, and encouraging students to share their insights and perspectives on power systems topics. ❖ Problem-Solving Sessions: Dedicated problem-solving sessions can be conducted where students work on exercises and examples related to smart grids. The instructor can guide students through the problem-solving process, addressing any challenges or misconceptions that may arise. ❖ Case Studies and Real-World Applications: Use case studies and real-world applications to demonstrate the relevance and practical implications of smart grids. This can involve analyzing smart grids and discussing their design, performance, and challenges. ❖ Group Projects: Assign group projects that require students to apply their knowledge of smart grids to real or simulated scenarios. This can involve designing and modelling a part of smart grids for specific applications, analyzing system performance, and presenting findings to the class. ❖ Computer Simulations: Utilize computer simulations and software tools specifically designed for smart grids analysis and design. This allows students to explore system behavior, simulate different smart grids operation strategies, and observe the impact of parameter variations. ❖ Guest Speakers: Invite industry professionals or researchers in the field of smart grids to share their experiences and insights. Guest speakers can provide real-world perspectives, discuss emerging trends, and inspire students in their learning journey. ❖ Online Resources and Multimedia: Provide access to online resources, textbooks, lecture recordings, and interactive multimedia materials that support the learning

	of smart grids. These resources can serve as supplementary materials for self-study and reinforce understanding. ❖ Formative and Summative Assessments: Incorporate a variety of assessment methods, including quizzes, assignments, lab reports, and examinations, to evaluate students' understanding and progress. Provide constructive feedback to help students improve their knowledge and skills in smart grids.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	62	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	63	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	4.2
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	125		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	2	10% (10)	7, 12	LO #1, 2, 6 and 9
	Assignments	2	10% (10)	4, 10	LO # 3, 4, 6 and 7
	Projects / Lab.	1	10% (10)	7	All
	Report	1	10% (10)	12	LO # 5, 8 and 9
Summative assessment	**Midterm Exam**	2 hr	10% (10)	7	LO # 1-6
	Final Exam	4hr	50% (50)	15	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
Week	Material Covered
Week 1	Renewable energy - Energy Storage Systems - Distributed energy resources (DER) and Grid Integration
Week 2	
Week 3	Introduction to smart grid
Week 4	Energy Management in smart grids

Week 5	
Week 6	Smart Meters , Smart Grid Standards + Mid exam
Week 7	
Week 8	IT Networks and Security
Week 9	
Week 10	Elements of the power grid and measurement technologies- load flow analysis- Locating and sizing storage- Introduction to simulation tools
Week 11	
Week 12	Optimization and Distributed Control.
Week 13	
Week 14	Economic drives of the smart grid
Week 15	Preparatory week before the final Exam
Week 16	Final Exam

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Introduction to ETAP
Week 2	PV and wind power simulation and modelling
Week 3	ESS and Distributed storage modeling
Week 4	Optimal power flow
Week 5	
Week 6	Study of the synchronous generator in island operation mode
Week 7	
Week 8	Load management and demand response
Week 9	
Week 10	
Week11	Virtual smart grid
Week 12	
Week 13	PV and ESS sizing
Week 14	

Learning and Teaching Resources

مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	James Momoh, “Smart Grid Fundamentals of Design and Analysis,” Wiley, 2012 ISBN 978-0-470-88939-8	Yes
Recommended Texts	A. Keyhani, “Design of Smart Power Grid Renewable Energy Systems,” Wiley 2011	Yes
Websites	(169) IIT Roorkee July 2018 - YouTube https://www.youtube.com/@IITRoorkeeJuly	

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 Systems II**			**Module Delivery**	
Module Type	**Core**			☒**Theory** ☐**Lecture** ☒**Lab** ☐**Tutorial** ☐**Practical** ☐**Seminar**	
Module Code	**CNT423**				
ECTS Credits	**6**				
SWL (hr/sem)	**150**				
Module Level		**UGIV**	**Semester of Delivery**		8
Administering Department		3	**College**		08
Module Leader	Ayad Mahmood Kwad		**e-mail**	ayad_m_k@yahoo.com	
Module Leader's Acad. Title		Lecturer	**Module Leader's Qualification**		Ph.D.
Module Tutor	Ayad Mahmood Kwad		**e-mail**	ayad_m_k@yahoo.com	
Peer Reviewer Name		Dr.Khalid J. Kazim	**e-mail**	khalid.j.kazim@gmail.com	
Scientific Committee Approval Date		15/06/2023	**Version Number**		1.0

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None	**Semester**	
Co-requisites module	DSP421	**Semester**	8

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	1. To Design and Tune PID Controllers: The module aims to provide students with hands-on experience in designing and tuning Proportional-Integral-Derivative (PID) controllers. Students will learn the principles of PID control and different tuning methods, including the Ziegler-Nichols method. They will gain practical skills in implementing PID controllers and assessing their performance. 2. To Explore Frequency-Domain Analysis: The module aims to introduce students to frequency-domain analysis techniques for control systems. Students will learn to analyze system behavior using frequency response plots, such as Bode plots, and gain an understanding of gain and phase margins. They will also explore the Nyquist stability criterion for assessing system stability. 3. To Design Compensators: The module aims to develop students' ability to design compensators for control systems. Students will learn various compensator design techniques, including lead, lag, and lead-lag compensators. They will understand how to shape the frequency response of control systems to meet desired specifications. 4. To Introduce State-Space Control Design: The module aims to introduce students to state-space representation and state feedback control. Students will learn about controllability and observability of state-space systems. They will gain practical experience in designing state feedback controllers and placing the system poles to achieve desired performance. 5. To Familiarize with Digital Control Systems: The module aims to familiarize students with digital control systems and discrete-time control techniques. Students will learn about the z-transform and its application in discrete-time systems. They will gain an understanding of the challenges and considerations in implementing control systems in a digital environment.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Design and tune Proportional-Integral-Derivative (PID) controllers using various methods and assess their performance in terms of stability and response characteristics. 2. Utilize frequency-domain analysis techniques, such as Bode plots and gain/phase margins, to assess the stability and performance of control systems. 3. Design compensators, including lead, lag, and lead-lag compensators, to shape the frequency response of control systems and achieve desired performance specifications. 4. Understand the principles of state-space representation and apply state feedback control techniques to design controllers and achieve desired system behavior. 5. Recognize the challenges and considerations in implementing control systems in a digital environment and apply discrete-time control techniques using the z-transform. 6. Apply critical thinking and problem-solving skills to analyze, design, and

	evaluate control systems for a variety of applications. 7. Communicate effectively about control systems engineering concepts, both orally and in written form, using appropriate technical terminology and notation. 8. Work effectively as part of a team to solve control systems engineering problems and collaborate on control system design projects.
Indicative Contents المحتويات الإرشادية	❖ Frequency-Domain Analysis: Frequency response analysis. Bode plots and gain/phase margins. Nyquist stability criterion. Stability analysis using frequency response methods. ❖ Controller Design: Proportional-Integral-Derivative (PID) controllers: principles and characteristics. PID controller tuning methods. Lead, lag, and lead-lag compensator design. Design specifications and trade-offs. ❖ Introduction to State-Space Control: State-space representation of control systems. Controllability and observability. State feedback and pole placement. Full-state feedback control. ❖ Digital Control Systems: Discrete-time systems and their representation. Z-transform and its application in discrete-time control systems. Sampled-data systems. Digital controller design techniques.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	❖ Lectures: In-class lectures delivered by the instructor provide the foundational knowledge and theoretical concepts of control systems. Lectures can include explanations, demonstrations, and the presentation of examples to illustrate key concepts. ❖ Interactive Discussions: Encourage active participation and engagement through interactive discussions. This can involve asking questions, facilitating group discussions, and encouraging students to share their insights and perspectives on control systems topics. ❖ Problem-Solving Sessions: Dedicated problem-solving sessions can be conducted where students work on exercises and examples related to control systems. The instructor can guide students through the problem-solving process, addressing any challenges or misconceptions that may arise.

	❖ Laboratory Work: Hands-on laboratory sessions provide practical experience in implementing control systems and validating theoretical concepts. Students can work with hardware and software tools to design, simulate, and analyze control systems. ❖ Case Studies and Real-World Applications: Use case studies and real-world applications to demonstrate the relevance and practical implications of control systems. This can involve analyzing control systems used in various industries and discussing their design, performance, and challenges. ❖ Group Projects: Assign group projects that require students to apply their knowledge of control systems to real or simulated scenarios. This can involve designing and implementing control systems for specific applications, analyzing system performance, and presenting findings to the class. ❖ Computer Simulations: Utilize computer simulations and software tools specifically designed for control systems analysis and design. This allows students to explore system behavior, simulate different control strategies, and observe the impact of parameter variations. ❖ Guest Speakers: Invite industry professionals or researchers in the field of control systems to share their experiences and insights. Guest speakers can provide real-world perspectives, discuss emerging trends, and inspire students in their learning journey. ❖ Online Resources and Multimedia: Provide access to online resources, textbooks, lecture recordings, and interactive multimedia materials that support the learning of control systems. These resources can serve as supplementary materials for self-study and reinforce understanding. ❖ Formative and Summative Assessments: Incorporate a variety of assessment methods, including quizzes, assignments, lab reports, and examinations, to evaluate students' understanding and progress. Provide constructive feedback to help students improve their knowledge and skills in control systems.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	90	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	6
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	60	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	4
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	150		

Module Evaluation

تقييم المادة الدراسية

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

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1 Week 2 Week 3	Frequency-Domain Analysis Frequency response analysis Bode plots and gain/phase margins. Stability analysis using frequency response methods
Week 4 Week 5 Week 6 Week 7	Controller Design PID controllers: principles and tuning methods Lead, lag, and lead-lag compensator design Design specifications and trade-offs Midterm Exam
Week 8 Week 9 Week 10	Introduction to State-Space Control State-space representation of control systems Controllability and observability State feedback and pole placement
Week 11 Week 12	Digital Control Systems Discrete-time systems and z-transform Sampled data systems

Week 13	Digital controller design techniques
Week 14	Problem-Solving and Review Review and reinforcement of key concepts Problem-solving sessions and exercises
Week 15	**Preparatory week before the final Exam**
Week 16	**Final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Design Lead / Lag Compensator Using Root Locus
Week 2	
Week 3	Frequency-Response Analysis (Bode Plot with MATLAB)
Week 4	
Week 5	Frequency-Response Analysis (Nyquist Analysis)
Week 6	
Week 7	PID Controller Design
Week 8	
Week 9	Tuning PID Controller for a linear plant model
Week 10	
Week 11	Discrete Time Systems
Week 12	
Week 13	Continuous-Discrete Conversion Methods
Week 14	

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Control Systems Engineering, 7th Edition by Norman S. Nise	No
Recommended Texts	Modern Control Engineering 5th Edition	Yes
Websites	http://ayadmk.blogspot.com/p/control-systems-engineering.html	

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

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

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Information Theory and Coding**			**Module Delivery**	
Module Type	**Core**			☒**Theory** ☐**Lecture** ☐**Lab** ☒**Tutorial** ☐**Practical** ☐**Seminar**	
Module Code	**ITC424**				
ECTS Credits	**4**				
SWL (hr/sem)	**100**				
Module Level		**UGIV**	**Semester of Delivery**		8
Administering Department			**College**	Type College Code	
Module Leader	Wassan Saad Abduljabbar Hayale		**e-mail**	Wassan.hayale@aliraqia.edu.iq	
Module Leader's Acad. Title		Lecturer	**Module Leader's Qualification**		Ph.D.
Module Tutor	Wassan Saad Abduljabbar Hayale		**e-mail**	Wassan.hayale@aliraqia.edu.iq	
Peer Reviewer Name		Assist Prof Dr. Baraa Munqith Albaker	**e-mail**	baraaalbaker@aliraqia.edu.iq	
Scientific Committee Approval Date		15/06/2023	**Version Number**	1.0	

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

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	1. Understanding the fundamental concepts of information theory, including the distinction between information theory and coding theory, the physical interpretation of information, and the properties of information. 2. Exploring discrete channels and their characteristics, including binary symmetric channels (BSC), ternary symmetric channels (TSC), capacity, efficiency, redundancy, and the concept of cascading channels. 3. Gaining knowledge of source coding techniques, including coding efficiency, redundancy, and the use of fixed-length codes for discrete sources. 4. Familiarizing students with variable length codes, such as Shannon code, Fano code, Huffman code, and source extension. 5. Developing an understanding of error detecting and error correcting codes, including their basic definition, even and odd parity generators, systematic and non-systematic codes, and the concepts of Hamming distance, weight, bound, and Hamming code. 6. Learning the principles and techniques involved in the encoding and decoding of linear block codes. 7. Gaining proficiency in encoding and decoding systematic cyclic codes, as well as the implementation of cyclic encoders and decoders. 8. Understanding the encoding and decoding processes of convolutional codes, including the use of state diagrams, trellis diagrams, tree diagrams, and the Viterbi algorithm. 9. Exploring advanced coding techniques, such as Reed-Solomon codes, Turbo codes, and Low-density parity-check (LDPC) codes. 10. Studying data compression techniques, including the importance of data compression, lossless algorithms as well as lossy compression techniques , and the trade-off between compression ratio and quality. 11. Understanding the practical applications of channel coding techniques in various communication systems, such as wireless, satellite, optical, storage, digital television, and multimedia.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Differentiating between information theory and coding theory, and explain the physical interpretation of information, its definition, and properties. 2. Describing discrete channels, including binary symmetric channels (BSC), ternary symmetric channels (TSC), and understand their capacity, efficiency, redundancy, and cascading. 3. Applying source coding techniques to discrete sources, evaluate coding efficiency and redundancy, and analyze the use of fixed-length codes. 4. Utilizing variable length codes such as Shannon code, Fano code, Huffman code, and understand source extension. 5. Understanding error detecting and error correcting codes, define them, implement even and odd parity generators, distinguish between systematic and non-systematic codes, and analyze Hamming distance, weight, bound,

	and Hamming code. 6. Encoding and decoding linear block codes. 7. Encoding and decoding systematic cyclic codes, implement cyclic encoders and decoders. 8. Encoding and decoding convolutional codes using state diagrams, trellis diagrams, tree diagrams, and the Viterbi algorithm. 9. Applying advanced coding techniques like Reed-Solomon codes, Turbo codes, and Low-density parity-check (LDPC) codes. 10. Applying data compression techniques, including lossless algorithms and analyzing lossy compression techniques, and evaluate the trade-off between compression ratio and quality. 11. Recognizing the practical applications of channel coding techniques in various communication systems, including wireless, satellite, optical, storage, digital television, and multimedia.
Indicative Contents المحتويات الإرشادية	1. Introduction to Information Theory and Channel Coding: • Information theory versus coding theory • Model and basic operations of information processing systems • Physical interpretation of the amount of information • Definition of information (measure of information) • Properties of information 2. Error Detection and Correction Codes: • Introduction to error detecting and error correcting codes • Even & Odd parity generators • Basic definition of error correcting codes • Systematic and non-systematic codes • Hamming Distance • Hamming weight • Hamming bound • Hamming Code 3. Block Codes and Convolutional Codes: • Linear Block Codes • Encoding and decoding of linear block codes • Introduction to convolutional codes • State Diagram • Trellis Diagram • Tree Diagram • Decoding of Convolutional Code • Viterbi Algorithm 4. Cyclic Codes: • Introduction to cyclic codes • Encoding of Systematic Cyclic Code

	• Implementation of Cyclic Encoder • Decoding of Systematic Cyclic Code • Implementation of Cyclic Decoder 5. Reed-Solomon Codes, Turbo Codes, and LDPC Codes: • Reed-Solomon codes • Turbo codes • Low-density parity-check (LDPC) codes 6. Information Theory in Data Compression: • Introduction to data compression and its importance • Lossless and Lossy data compression techniques 7. Applications of channel Coding Techniques • Applications of channel coding techniques in wireless communication systems, satellite communication systems, optical communication systems, storage systems, and digital television and multimedia systems

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	1. Lectures: Engaging lectures to introduce fundamental concepts of Information Theory, coding techniques, and error control codes. Real-world examples to illustrate practical applications. 2. Assignments: Individual and group projects to apply understanding of Information Theory and error control codes and to enhance comprehension and practical application of concepts. 3. Quizzes and Examinations: Assessing students' comprehension, analytical skills, and problem-solving abilities in Information Theory and error control codes through quizzes and exams. 4. Project work and interactive sessions to encourage critical thinking, problem-solving, and knowledge sharing among students. 5. Additional Resources: Providing supplementary reading materials, scholarly articles, and online resources for in-depth exploration of Information Theory and error control codes.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	46	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	3
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	54	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	3.6
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	100		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	2	10% (10)	4, 11	All
	Assignments	2	10% (10)	6, 10	All
	Projects	1	10% (10)	Continuous	All
	Report	1	10% (10)	13	All
Summative assessment	**Midterm Exam**	1hr	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 Information Theory and Channel Coding • Information theory versus coding theory • Physical interpretation of the amount of information

	• Definition of information (measure of information) • Properties of information • Entropy and its properties
Week 2	Discrete Channels and cascading of channel • Binary Symmetric Channel (BSC) • Ternary Symmetric Channel (TSC) • Capacity, efficiency, and redundancy of symmetric and non-symmetric discrete channels • Cascading of Channels
Week 3	Source Coding and fixed-length codes • Source Coding of Discrete sources • Coding Efficiency and Redundancy • Fixed-Length Codes
Week 4	Variable Length Code: • Shannon code • Fano code • Huffman code • Source Extension
Week 5	Error detecting and error correcting codes • Basic definition of error correcting codes • Even & Odd parity generators • Systematic and non-systematic codes • Hamming Distance, Hamming weight, Hamming bound, and Hamming Code
Week 6	Linear Block Codes • Encoding and decoding of linear block codes
Week 7	Cyclic codes • Encoding of Systematic Cyclic Code • Implementation of Cyclic Encoder • Decoding of Systematic Cyclic Code • Implementation of Cyclic Decoder
Week 8-9	Midterm Exam Convolutional Codes: • Encoding of Convolutional Code (State Diagram, Trellis Diagram, and Tree Diagram)

	• Decoding of Convolutional Code (Viterbi Algorithm)
Week 10	Reed-Solomon, Turbo, and LDPC Codes • Reed-Solomon codes • Turbo codes • Low-density parity-check (LDPC) codes
Week 11-13	Data compression: • Introduction to data compression and its importance • Lossless data compression algorithms (e.g., Run-Length Encoding, Huffman Coding, Arithmetic Coding) • Shannon's Source Coding Theorem and its implications in data compression • Lossy data compression techniques (e.g., Transform coding, Quantization, Delta modulation) • Rate-distortion theory and trade-off between compression ratio and quality
Week 14	Applications of channel coding techniques in various communication systems (wireless, satellite, optical, storage, digital television, multimedia)
Week 15	**Preparatory week before the final Exam**
Week 16	Final Exam

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	1. "Elements of Information Theory" by Thomas M. Cover and Joy A. Thomas 2. "Error Control Coding" by Shu Lin and Daniel J. Costello Jr. 3. "Information Theory and Coding" by Dr. J. S. Chitode	No
Recommended Texts	1. "Channel Coding: Theory, Algorithms, and Applications" by Elwyn Berlekamp	No

	2. "Modern Coding Theory" by Tom Richardson and Rüdiger Urbanke 3. "Introduction to Coding Theory" by Ron Roth	
Websites	1. Information Theory Society: https://www.itsoc.org/	

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks (%)**	**Definition**
Success Group (50 - 100)	**A -** Excellent	امتياز	90 - 100	Outstanding Performance
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	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	**Artificial Intelligence**			**Module Delivery**	
Module Type	**Elective**			☒**Theory** ☐**Lecture** ☒**Lab** ☐**Tutorial** ☐**Practical** ☐**Seminar**	
Module Code	**AIN426**				
ECTS Credits	**5**				
SWL (hr/sem)	**125**				
Module Level	UGIV		**Semester of Delivery**	8	
Administering Department	3		**College**	08	
Module Leader	Wassan Saad Abduljabbar Hayale Rasha Subhi Ali		**e-mail**	Wassan.Hayale@aliraqia.edu.iq rasha.s.ali@aliraqia.edu.iq	
Module Leader's Acad. Title	Lecturer Lecturer		**Module Leader's Qualification**	Ph.D. Ph.D.	
Module Tutor	Wassan Saad Abduljabbar Hayale		**e-mail**	Wassan.Hayale@aliraqia.edu.iq	
Peer Reviewer Name	Asst. Prof Dr. Baraa Munqith Albaker		**e-mail**	baraaalbaker@aliraqia.edu.iq	
Scientific Committee Approval Date	15/06/2023		**Version Number**	1.0	

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

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	The aim of this module is to provide students with a comprehensive understanding of the application of Artificial Intelligence (AI) techniques in the field of Electrical Engineering. By the end of the module, students should be able to: 1. Understanding the fundamental concepts of AI and its applications in Electrical Engineering. 2. Explaining the basics of Neural Networks, including their architecture, activation functions, and training algorithms. 3. Gaining knowledge of Machine Learning and Deep Learning fundamentals, including supervised, unsupervised, and reinforcement learning, as well as key machine learning algorithms. 4. Applying optimization techniques for enhancing the performance of AI models in Electrical Engineering applications. 5. Comprehend the principles of Fuzzy Logic and its applications in Electrical Engineering, including fuzzy sets, fuzzy rules, fuzzification, and defuzzification. 6. Analyzing real-world case studies and projects that demonstrate the practical implementation of AI techniques in Electrical Engineering domains. 7. Recognizing the future trends and advancements in AI for Electrical Engineering and their potential impact on the industry.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Demonstrating a comprehensive understanding of Artificial Intelligence (AI) concepts and their relevance in the field of Electrical Engineering. 2. Analyzing and explaining the basic principles of Neural Networks, including their architecture, activation functions, and training algorithms. 3. Applying Machine Learning and Deep Learning algorithms to solve problems in Electrical Engineering, including supervised, unsupervised, and reinforcement learning techniques. 4. Utilizing optimization techniques to enhance the performance and efficiency of AI models in Electrical Engineering applications. 5. Understanding and applying Fuzzy Logic principles, including fuzzy sets, fuzzy rules, fuzzification, and defuzzification, to address complex problems in Electrical Engineering. 6. Evaluating and analyzing real-world case studies and projects that demonstrate the practical application of AI techniques in Electrical Engineering domains. 7. Identifying and discussing emerging trends and future directions in AI for Electrical Engineering, considering their potential impact on the industry. 8. Developing practical skills in implementing AI algorithms, utilizing appropriate software tools and libraries, and critically evaluating the performance of AI

	models in Electrical Engineering applications. 9. Collaborating effectively in group projects, demonstrating effective communication, teamwork, and problem-solving skills in the context of AI applications in Electrical Engineering.
Indicative Contents المحتويات الإرشادية	1. Introduction to Artificial Intelligence (AI): • Overview of AI: Providing a high-level introduction to the field of AI, its goals, and its relevance to various industries, including electrical engineering. • Historical overview: Mentioning the development and milestones in the field of AI. 2. Neural Networks: • Basics of neural networks: Explaining the concept of a neural network, including its architecture, activation functions, and backpropagation. • Introducing the Perceptron as a basic building block of neural networks, discussing its structure, and explaining the concept of training the Perceptron by adjusting the weights using the various learning rule like Hebbian learning rule. • Expanding on the basic Perceptron by introducing multi-layer neural networks. • Discussing the architecture, including input layer, hidden layers, and output layer. • Explaining the feedforward process and the use of activation functions to compute outputs. • Introducing the backpropagation algorithm for adjusting weights in multi-layer neural networks. 3. Machine Learning and Deep Learning Fundamentals: • Introduction to supervised, unsupervised, and reinforcement learning: Providing an overview of different types of machine learning and their applications in electrical engineering. • Understanding key machine learning algorithms: Discussing several popular algorithms for machine learning. • Training and evaluation of machine learning models: Explaining the process of training models and evaluating their performance using metrics such as accuracy and loss. • Introduction to deep learning and deep neural networks: Discussing the advancements in deep learning and the use of deep neural networks for solving complex problems. 4. Optimization Techniques: • Introduction to optimization algorithms: Explain optimization algorithms, including gradient descent, stochastic gradient descent, and

genetic algorithms. Discussing their applications in fine-tuning AI models for better performance.

5. Fuzzy Logic and Fuzzification:
    - Understanding Fuzzy Logic and Fuzzy Sets:
        - Explaining the concept of fuzzy logic and its applications in electrical engineering.
        - Discussing fuzzy sets, membership functions, and linguistic variables.
    - Fuzzy Rules:
        - Introducing fuzzy rules as a fundamental component of fuzzy logic systems.
        - Explaining how fuzzy rules are constructed using if-then statements.
        - Discussing the use of fuzzy rule sets for decision-making and control in electrical engineering.
    - Fuzzification:
        - Explaining the process of converting crisp inputs into fuzzy inputs using membership functions.
    - Defuzzification:
        - Introducing defuzzification as the process of converting fuzzy outputs into crisp outputs.
        - Discussing common defuzzification methods, such as centroid-based methods or maximum membership methods.
6. Application of AI in Electrical Engineering
    - Real-world case studies: Presenting practical examples demonstrating the application of AI techniques, including neural networks, machine learning, deep learning, optimization techniques, and fuzzy logic, in various areas of electrical engineering. Several examples of AI techniques that can be applied within the field of electrical engineering encompass power systems, control systems, signal processing, smart grids, renewable energy, and various other domains.
    - Future Trends in AI for Electrical Engineering: Highlighting emerging trends and advancements in AI that are shaping the future of electrical engineering. Some areas to explore include explainable AI, edge computing, Internet of Things (IoT) applications, and machine learning for hardware design.
    - Real-world projects: Engaging students in real world projects that involve implementing and analyzing AI techniques to solve specific challenges in electrical engineering. These projects can focus on areas such as power systems optimization, control system design, signal

	processing applications, smart grid development, and renewable energy integration.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	1. Lectures: Delivering engaging lectures to teach the fundamental concepts of AI in electrical engineering. Use real-world examples to demonstrate AI applications in relevant electrical engineering domains. 2. Lab Sessions: Conducting lab sessions that use Python programming language to implement AI algorithms and techniques relevant to electrical engineering applications. 3. Assignments: Assigning individual and group projects that require applying AI techniques to solve specific electrical engineering problems. 4. Quizzes and Examinations: Administering quizzes and exams to assess students' comprehension of theoretical concepts, algorithm implementations, and their application in electrical engineering. 5. Projects: Assigning individual or group projects that involve designing and implementing AI-based solutions for complex electrical engineering problems. 6. Additional Online Resources and Coding Examples: Granting students easy access to online materials, tutorials, and educational platforms that supplement their learning and offer coding examples specifically related to AI techniques in electrical engineering.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	62	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	63	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	4.2
Total SWL (h/sem)	125		

الحمل الدراسي الكلي للطالب خلال الفصل	

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

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Introduction to Artificial Intelligence (AI) for Electrical Engineering.
Weeks 2	Neural Networks: • Basics of Neural Networks. • Multi-layer Neural Networks.
Weeks 3	
Weeks 4	
Week 5	Machine Learning and Deep Learning Fundamentals: • Introduction to Machine Learning. • Key Machine Learning Algorithms. • Training and Evaluation of Models. • Introduction to Deep Learning. Midterm Exam
Week 6	
Week 7	
Week 8	Optimization Techniques.
Week 9	Fuzzy Logic
Week 10	

Week 11	• Understanding Fuzzy Logic and Fuzzy Sets. • Fuzzy Rules. • Fuzzification. • Defuzzification.
Week 12	Case Studies and Projects: • Real-world case studies demonstrating the application of AI techniques in electrical engineering domains. • Future Trends in AI for Electrical Engineering. • Real-world projects involving the implementation and analysis of AI techniques for electrical engineering applications.
Week 13	
Week 14	
Week 15	Preparatory week before the final Exam
Week 16	Final Exam

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab Sessions for Python Fundamentals and Dataset Preparation: • Introduction to Python programming for AI applications. • Basics of data handling, manipulation, and visualization using Python libraries (e.g., NumPy, Pandas, Matplotlib). • Preparing datasets for training and evaluation.
Week 2	
Week 3	Lab Sessions for Neural Networks: • Implementing a basic neural network from scratch using Python. • Exploring different activation functions and their impact on network performance. • Implementing backpropagation algorithm for training neural networks. • Fine-tuning neural network parameters and architectures.
Week 4	
Week 5	
Week 6	Midterm Exam Lab Sessions for Machine Learning and Deep Learning Fundamentals:

Week 7	• Implementing and evaluating machine learning algorithms using Python libraries (e.g., scikit-learn). • Exploring deep learning frameworks (e.g., TensorFlow) and implementing deep neural networks. • Training and evaluating machine learning and deep learning models on real-world datasets. • Fine-tuning hyperparameters and optimizing model performance.
Week 8	
Week 9	Lab Sessions for Fuzzy Logic: • Implementing fuzzy logic systems using Python libraries (e.g., scikit-fuzzy). • Designing fuzzy membership functions and rule sets for specific electrical engineering applications. • Fuzzifying inputs and defuzzifying outputs using appropriate methods. • Evaluating and optimizing fuzzy logic systems for decision-making and control tasks.
Week 10	
Week 11	
Week 12	Lab Sessions for Case Studies and Projects: • Collaborating on group projects to address complex AI challenges in electrical engineering. • Presenting project outcomes and sharing insights gained from the practical implementation of AI techniques.
Week 13	
Week 14	

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	1. "Artificial Intelligence: A Modern Approach" by Stuart Russell and Peter Norvig 2. "Neural Networks and Deep Learning: A Textbook" by Charu Aggarwal 3. "Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow: Concepts, Tools, and Techniques to Build Intelligent Systems" by Aurélien Géron 4. "Deep Learning" by Ian Goodfellow, Yoshua Bengio, and Aaron Courville available at https://www.deeplearningbook.org/ 5. "Convex Optimization" by Stephen Boyd and Lieven Vandenberghe	No

	6. "Fuzzy Logic with Engineering Applications" by Timothy J. Ross	
Recommended Texts	1. "Artificial Intelligence: Foundations of Computational Agents" by David L. Poole and Alan K. Mackworth 2. "Artificial Intelligence: Structures and Strategies for Complex Problem Solving" by George F. Luger 3. "Deep Learning" by Ian Goodfellow, Yoshua Bengio, and Aaron Courville 4. "Pattern Recognition and Machine Learning" by Christopher M. Bishop 5. "Machine Learning: A Probabilistic Perspective" by Kevin P. Murphy 6. "Deep Learning with Python" by François Chollet 7. "Optimization Methods for Large-Scale Machine Learning" by Léon Bottou, Frank E. Curtis, and Jorge Nocedal 8. "Genetic Algorithms in Search, Optimization, and Machine Learning" by David E. Goldberg 9. "Numerical Optimization" by Jorge Nocedal and Stephen Wright 10. "Fuzzy Logic: Intelligence, Control, and Information" by John Yen and Reza Langari	No
Websites	1. TensorFlow (www.tensorflow.org) - An open-source platform for machine learning and deep learning 2. scikit-learn (scikit-learn.org) - A library for machine learning in Python. 3. IEEE Xplore (ieeexplore.ieee.org) - A digital library with research papers on AI and electrical engineering 4. Towards Data Science (towardsdatascience.com) - A platform for AI and data science articles and tutorials	

Grading Scheme مخطط الدرجات

Group	Grade	التقدير	Marks (%)	Definition
Success Group (50 - 100)	**A -** Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
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	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
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