Ministry of Higher Education and Scientific Research
Scientific Supervision and Scientific Evaluation Apparatus
Directorate of Quality Assurance and Academic Accreditation
Accreditation Department

Academic Program and Course Description Guide

2025-2026

Academic Program Description Form

University Name: Tikrit

Faculty/Institute: Shirqat Engineering College

Scientific Department: Electrical Engineering Department

Academic or Professional Program Name: B.Sc. in Electrical Engineering

Final Certificate Name: Bachelor of Science in Electrical Engineering

Academic System: Bologna and Coursed Based

Description Preparation Date: 26–7–2025

File Completion Date: 15–10–2025

Signature:

Head of Department Name:

Asst Prof. Dr. Ayad Atiyah Abdulkafi

Date: 15–10–2025

Signature:

Scientific Associate Name:

Asst Prof. Dr. Alaa Yousif Ali

Date: 20/10/2025

The file is checked by: Hamed Hussein Ahmed

Department of Quality Assurance and University Performance

Director of the Quality Assurance and University Performance Department:

Date: 20/10/2025

Signature:

Approval of the Dean

Prof. Dr. Khamis Khalaf Hassan

Introduction:

The educational program is a well-planned set of courses that include procedures and experiences arranged in the form of an academic syllabus. Its main goal is to improve and build graduates' skills so they are ready for the job market. The program is reviewed and evaluated every year through internal or external audit procedures and programs like the External Examiner Program.

The academic program description is a short summary of the main features of the program and its courses. It shows what skills students are working to develop based on the program's goals. This description is very important because it is the main part of getting the program accredited, and it is written by the teaching staff together under the supervision of scientific committees in the scientific departments.

This guide, in its second version, includes a description of the academic program after updating the subjects and paragraphs of the previous guide in light of the updates and developments of the educational system in Iraq, which included the description of the academic program in its traditional form (annual, quarterly), as well as the adoption of the academic program description circulated according to the letter of the Department of Studies T 3/2906 on 3/5/2023 regarding the programs that adopt the Bologna Process as the basis for their work.

In this regard, we can only emphasize the importance of writing an academic programs and course description to ensure the proper functioning of the educational process.

1. Mission & Vision Statement

Vision Statement

The Department of Electrical Engineering will provide programs of the highest quality to produce globally competent engineers who can address challenges of the millennium to achieve sustainable socio-economic development. Our vision is to be innovators in electrical engineering education and research to spearhead sustainable and environment-friendly economic development.

Mission Statement

The Mission of the Bachelor of Electrical Engineering Programme is to inculcate students with essential knowledge, skills and values required for sustainable design, development and innovation in the field of electrical engineering for socio-economic growth and enabling them for lifelong learning to contribute towards interdisciplinary engineering solutions.

2. Program Specification

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

The Electrical Engineering program provides a foundation for work in the fields of analog and digital electronics, microelectronics, signal processing, communications, power generation, transmission and distribution, electrical machines, computing systems, controls, and general electrical engineering applications. Topics specific to Electrical Engineering are studied in specialized focus areas in the third and fourth levels.

At level 1, students will develop their essential mathematical and analytical skills and knowledge by studying four core modules: Engineering Math, Basic of Electrical Engineering, Computer programming and digital techniques. Students contextualize and develop their learning further through the following modules, Electronic physics, Engineering mechanics, Engineering Drawings and other basic learning modules. Where possible and appropriate, students are encouraged to draw upon their learning and experience in the workplace to contextualize their learning.

In Level 2, students build on their first-year learning by studying the five core modules: Electrical Networks, Electronic I, DC Electrical Machines, Mathematics II and Computer Programming II. In addition to building on prior learning, these units further develop students' transferable and intellectual

skills and knowledge and require students to apply these skills and knowledge. During Level 2, students also undertake more basic modules: Engineering Statistics and Electromagnetic Fields with well-integrated content across courses to reinforce program learning objectives and develop the skills and attitudes that will promote student success.

More specific core topics are covered at Levels 3 and 4. A Leeds Electrical Engineering graduate is therefore trained to appreciate how research informs teaching, according to the University and college Mission statements. At Level 3 and 4 students are free to choose more elective module credits with the proviso a range of modules are selected that reflect the complexity of electrical circuits, through study the electrical networks, power electronics, information and communication systems and electronics to populations to ensure the breadth of knowledge expected of a graduate with an electrical engineering degree. This allows students to develop their own wide-ranging interests in electrical circuits behaviour. Decisions on what to study are made with input from personal tutors. At Level 4 all students carry out an independent research project, which may be a credit library or data analysis project, or a credit field or laboratory-based project.

3. Program Goals

The aim of the Electrical Engineering Program is to train students who are willing to become Electrical Engineers to become sound in the field. The trained students should be confident, self-reliant and be able to execute what they have learnt and strive to be the best among equals and to be able to do this independently. Other goals are:

1. To produce graduates in Electrical Engineering who are registerable with professional bodies and have a burning desire to excel in their chosen profession.
2. To provide a comprehensive education in electrical engineering that stresses scientific reasoning and problem solving across the spectrum of disciplines within electrical power system.
3. To prepare students for a wide variety of post-baccalaureate paths, including graduate school, professional training programs, or entry level jobs in any area of electrical engineering.
4. To provide extensive hands-on training in electronic technology, statistical analysis, laboratory skills, and field techniques
5. To provide thorough training in written and oral communication of scientific information.
6. To enrich students with opportunities for alternative education in the area of Electrical Engineering, communication Engineering, Control Engineering, power system Engineering, through undergraduate research, internships, and study-abroad.

4. Student Learning Outcomes

Student Learning Outcomes describe the knowledge, skills and dispositions that students have learned from completing the Engineering Technology program. Each student learning outcome is mapped to a

program education objective, which prepares graduates to attain the program educational objectives within a few years of graduation.

Outcome 1

Students will be able to select and apply the knowledge, techniques, skills, and modern tools of the discipline to broadly defined engineering technology activities.

Outcome 2

Students will be able to select and apply principles of mathematics, science, engineering, and technology to engineering technology problems that require the application of principles and applied procedures or methodologies.

Outcome 3

Students will be able to conduct standard tests and measurements; to conduct, analyze, and interpret experiments; and to apply experimental results to improve processes.

Outcome 4

Students will be able to design systems, components, or processes for broadly-defined engineering technology problems appropriate to program educational objectives.

Outcome 5

Students will be able to function effectively as a member or leader on a technical team.

Outcome 6

Students will be able to identify, analyze, and solve broadly-defined engineering technology problems.

Outcome 7

Students will be able to apply written, oral, and graphical communication in both technical and non-technical environments; and an ability to identify and use appropriate technical literature.

Outcome 8

Students will be able to recognize the need for engage in lifelong learning to maintain and enhance their knowledge of the discipline.

Outcome 9

Students will be able to identify contemporary issues encountered in the engineering technology profession related to diversity and the impact of technology decision on a global society.

Outcome 10

Students will be able to explain the ethical and professional responsibilities associated with the practice of engineering technology.

Outcome 11

Students will be able to demonstrate the importance of quality, timeliness and continuous improvement to the field of engineering technology.

5. Academic Staff

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6. Credits, Grading and GPA

Credits

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

7. Curriculum/Modules

Semester 1 | 30 ECTS | 1 ECTS = 25 hrs

Code	Module name	SSWL	USSWL	ECTS	Type	Prerequisite
TUSHEE1100	Mathematics I	123	77	8	C	None
TUSHEE1101	Engineering Drawings	48	102	6	S	None
UOT003	Computer	63	87	6	C	None
TUSHEE1103	Physical Electronic	63	87	6	C	None
UOT001	Arabic Language I	33	17	2	B	None
UOT002	English Language I	33	17	2	B	None

Semester 2 | 30 ECTS | 1 ECTS = 25 hrs

Code	Module	SSWL	USSWL	ECTS	Type	Prerequisite
TUSHEE1200	Fundamentals of Electrical Engineering	153	47	8	C	None
TUSHEE1201	Digital Techniques	123	77	8	C	None
TUSHEE1202	Engineering Mechanics	63	37	4	S	None

TUSHEE1203	Engineering Workshop	63	37	4	S	None
TUSHEE1205	MATLAB Programming	63	37	4	C	None
UOT004	Democracy and Human Rights	33	17	2	B	None

Semester 3 | 30 ECTS | 1 ECTS = 25 hrs

Code	Module	SSWL	USSWL	ECTS	Type	Prerequisite
TUSHEE2100	Electrical Networks	93	107	8	C	TUSHEE1200
TUSHEE2101	Electronic I	138	62	8	C	None
TUSHEE2102	Electrical Machines I (DC)	138	62	8	C	None
TUSHEE2103	Engineering Statistics	48	102	6	S	None

Semester 4 | 30 ECTS | 1 ECTS = 25 hrs

Code	Module	SSWL	USSWL	ECTS	Type	Prerequisite
TUSHEE2200	Mathematics II	93	107	٨	C	TUSHEE1100
UOT031	Computer Programming	123	77	٨	C	None
TUSHEE2202	Electromagnetic Fields	63	137	٨	C	None
UOT021	English Language II	33	17	٢	B	UOT002
UOT005	The Crimes of Baath Regime in Iraq	33	17	٢	B	None
UOT011	Arabic Language II	33	17	٢	B	UOT001

Semester 5 | 30 ECTS | 1 ECTS = 25 hrs

Code	Module	SSWL	USSWL	ECTS	Type	Prerequisite
TUSHEE3100	Electrical Power System	78	72	٦	C	TUSHEE1200
TUSHEE3101	Engineering and Numerical Analysis	78	72	٦	C	TUSHEE2200
TUSHEE3102	Communication Systems	123	77	٨	C	None
TUSHEE3103	Transmission Lines and Antenna	63	37	٤	C	None
TUSHEE3107	Computer Networks	48	102	٦	E	TUSHEE2203

*See Department elective courses to select accordingly.

Semester 6 | 30 ECTS | 1 ECTS = 25 hrs

Code	Module	SSWL	USSWL	ECTS	Type	Pre-request
TUSHEE3200	Electrical Machines II (AC)	123	77	8	C	None
TUSHEE3201	Electronic II	123	77	8	C	TUSHEE2101
TUSHEE3202	Microprocessor Engineering	123	77	8	C	None
TUSHEE3203	Electrical Measurements	63	37	4	S	None
TUSHEE3204	Electrical Engineering Ethics	33	17	2	E	None

*See Department elective courses to select accordingly.

Semester 7 | 30 ECTS | 1 ECTS = 25 hrs (Currently not applied in this year)

Code	Module	SSWL	USSWL	ECTS	Type	Prerequisite
TUSHEE4100	Engineering Control	153	47	8	C	TUSHEE2200
TUSHEE4101	Power Electronics	153	47	8	C	TUSHEE1200
TUSHEE4102	Digital System Design	63	87	6	C	TUSHEE1201
TUSHEE4103	Graduation Project I	33	67	4	C	None
TUSHEE410X	Elective Course - Department	63	37	4	E	Based on selected Course

*See Department elective courses to select accordingly.

Semester 8 | 30 ECTS | 1 ECTS = 25 hrs (Currently not applied in this year)

Code	Module	SSWL	USSWL	ECTS	Type	Prerequisite
TUSHEE4200	Information Theory and Coding	63	87	6	C	TUSHEE3102
TUSHEE4201	Power System Analysis and Protections	93	107	8	C	TUSHEE1200
TUSHEE4202	Digital Signal Processing	63	87	6	C	TUSHEE3101
TUSHEE4203	Graduation Project II	33	67	4	C	TUSHEE4103
TUSHEE420X	Elective Course - Department	48	102	6	E	

*See Department elective courses to select accordingly.

8. Contact

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9. Overview and Undergraduate Courses/Modules 2025-2026

This catalogue is about the courses (modules) given by the program of Electrical Engineering to earn the Bachelor of Science degree. The program delivers (42) Modules with (6000) total student workload hours and 240 total ECTS in addition to graduation project and internship requirements. The module delivery is based on the Bologna Process.

	Ministry of Higher Education and Scientific Research - Iraq University of Tikrit College of Engineering-Shirqat Departments of Engineering collage	

MODULE DESCRIPTOR

وصف المادة الدراسية

Module Information معلومات المادة الدراسية			
Module Title	**MATHEMATICS I**	**Module Delivery**	
Module Type	**CORE**	☒ Theory ☒ Tutorial	
Module Code	**TUSHEE1100**		
ECTS Credits	**8**		
SWL (hr/sem)	**200**		
Module Level	**1**	**Semester (s) offered**	**1**
Administering Department	**Electrical**	**College**	**Engineering- Shirqat**
Module Leader	**Mahmood Ali Ahmed**	**e-mail**	mh.dham@tu.edu.iq
Module Leader's Acad. Title	**Assistant Professor**	**Module Leader's Qualification**	**MSC**
Module Tutor	**Asst Prof. Dr. Alaa Yousif Ali**	**e-mail**	alaa.y.ali@tu.edu.iq
Peer Reviewer Name	**Asst lecture Sura Hamad faraj**	**e-mail**	sura.faraj@tu.edu.iq

Review Committee Approval	01/06/2024	**Version Number**	2.0

Relation With Other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None	**Semester**	-
Co-requisites module	None	**Semester**	-

Module Aims, Learning Outcomes, Indicative Contents and Brief Description أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية مع وصف مختصر	
Module Aims أهداف المادة الدراسية	1. Understand Trigonometry, Analytic Geometry, Sets, Relations, and Learn types of Functions (Algebraic and Trigonometric), Differentiation and Integration 2. Understand and analyze concepts of matrices and determinants and Understand Complex Numbers: Invented number systems, The Argand diagram, Addition, Subtraction, Product, Qutient, Power and Roots, Demoiver s theorem. 3. Understand Transcendental Functions: (Inverse Trigonometric, Natural Logarithmic, Exponential and Power.) 1. i) Definitions ii) Properties iii) Graphs iv) Derivatives and Integrals. 4. Applications of the Definite Integral: areas between curves. ii) Volumes of revolution. iii) Length of the curve. iv) Surface Area of revolution. 5. Understand Approximation Integral: Trapezoidal, Simpson. 6. Understand and analyze Methods of Integration: Trigonometric Substitutions, Quadratics, Partial Fractions, Integration by parts, Further Substitutions. 7. Understand Hyperbolic Functions: Definition, Properties, Graphs, Inverse hyperbolic, Differentiation and Integration, 8. Understand Vector Algebra: Representation of Vectors in space, unit vectors, Scalar Product, Vector Product.

	9. Understand Polar Coordinates: The polar coordinate system, Graphs of polar equations, Plane area in polar coordinates.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	On successful completion of the course students will be able to: **LO1.**Brief Review: Trigonometry, Analytic Geometry, Sets, Relations, Functions (Algebraic and Trigonometric), Differentiation and Integration. **LO2**. Understand and analyze concepts of matrices and determinants and Understanding Complex Numbers . **LO3.** Understand Transcendental Functions: (Inverse Trigonometric, Natural Logarithmic, Exponential and Power.) i) Definitions ii) Properties iii) Graphs iv) Derivatives and Integrals. **LO4.** Understanding Applications of the Definite Integral **LO5.**Understanding Approximation Integral: Trapezoidal, Simpson.. **LO6.**Understanding and analyze Methods of Integration. **LO7.** Understanding Hyperbolic Functions. **LO8.** Understanding Hyperbolic Functions **LO9.** Understanding Vector Algebra **LO10.** Understanding Polar Coordinates
Indicative Contents المحتويات الإرشادية	Indicative contents include the following. **Part A: Mathematics I (45 Hours)** 1. Brief Review: Trigonometry, Analytic Geometry, Sets, Relations, Functions (Algebraic and Trigonometric), Differentiation and Integration.. (12 hours) 2. Matrices and Determinants: (6hours) 3. Complex Numbers: (6 hours) 4. Transcendental Functions: (9 hours) 5. Applications of the Definite Integral: (12 hours) **Part B: Mathematics I (45 hours)**

	1. Approximation Integral: (8 hours) 2. Methods of Integration:: (15 hours) 3. Hyperbolic Function: (8 hours) 4. Vector Algebra: (6 Hours) 5. Polar Coordinates: (8 hours)
Course Description	This course provides an introduction to the basic concepts and techniques of calculus and linear algebra, emphasizing their inter-relationships and applications to engineering, the sciences, and develops problem solving skills with both theoretical and practical problems. Topics covered are - Calculus: Functions of one variable, differentiation, and its applications, the definite integral, techniques of integration. Algebra: Systems of linear equations, subspaces, matrices, optimization, determinants, applications of linear algebra. The course is aimed at developing the basic Mathematical skills for Engineering students that are imperative for effective understanding of Engineering subjects. The topics introduced will serve as basic tools for specialized studies in many Engineering fields.
Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The teaching of the course is delivered through a combination of lectures, online lectures, tutorials, exercise.

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	123	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	8.2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	77	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	5.1
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	4	40 % (40)	4, 7, 10, 13	All LO
	Tutorial				
Summative assessment	Midterm Exam	2 hr	10% (10)	8	LO # 1-5
	Final Exam	3 hr	60% (60)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	Brief Review: Trigonometry, Analytic Geometry, Sets, Relations, Functions (Algebraic and Trigonometric),
Week 2	Differentiation , Integration ,and Matrices and Determinants:
Week 3	Complex Numbers: Invented number systems, The Argand diagram, Addition, Subtraction, Product, Qutient, Power and Roots, Demoiver s theorem.
Week 4	Transcendental Functions: (Inverse Trigonometric, Natural Logarithmic, Exponential and Power.) i) Definitions ii) Properties iii) Graphs iv) Derivatives and Integrals.
Week 5	Applications of the Definite Integral: areas between curves. ii) Volumes of revolution.

Week 6	Length of the curve. and Surface Area of revolution.
Week 7	Approximation Integral: Trapezoidal, Simpson.
Week 8	Methods of Integration: Trigonometric Substitutions, Quadratics,
Week 9	Partial Fractions, Integration by parts, Further Substitutions.
Week 10	Hyperbolic Function: Definition, Properties, Graphs, Inverse hyperbolic, Differentiation and Integration,
Week 11	Vector Algebra: Representation of Vectors in space
Week 12	, unit vectors, Scalar Product, Vector Product.
Week 13	Polar Coordinates: The polar coordinate system, Graphs of polar equations,
Week 14	Plane area in polar coordinates.
Week 15	Preparing for Final Exam
Week 16	**Final Exam**

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	**Available in the Library?**
Required Texts	THOMAS' CALCULUS TWELFTH EDITION	Yes
Recommended Texts	*1.Fifth edition* John Bird BSc(Hons), CEng, CSci, CMath, FIET, MIEE, FIIE, FIMA, FCollT 2. Understanding Basic Calculus By S.K	No
Websites	https://www.math.nagoya-u.ac.jp/	

APPENDIX:

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	مقبول بقرار	(45-49)	More work required but credit awarded
	F - Fail	راسب	(0-44)	Considerable amount of work required
Note:				

NB 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.

	Ministry of Higher Education and Scientific Research - Iraq University of Tikrit College of Engineering Shirqat Department of Engineering collage	

MODULE DESCRIPTOR

وصف المادة الدراسية

Module Information معلومات المادة الدراسية				
Module Title	**ENGINEERING DRAWING**		**Module Delivery**	
Module Type	SUPLEMENT		☐ **Theory** ☐ **Lecture** ☒ **Lab** ☐ **Tutorial** ☒ **Practical**	
Module Code	**TUSHEE1101**			
ECTS Credits	6			
SWL (hr/sem)	**150**			
Module Level	1		**Semester (s) offered**	1
Administering Department	Electrical Engineering		**College**	Engineering
Module Leader	Omar Hamad		**e-mail**	omar.ham.farag@tu.edu.iq
Module Leader's Acad. Title	Lecturer		**Module Leader's Qualification**	Ph. D
Module Tutor	None		**e-mail**	None
Peer Reviewer Name	Omar Hamad		**e-mail**	omar.ham.farag@tu.edu.iq
Review Committee Approval	18/09/2025		**Version Number**	2.0

Relation With Other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None	**Semester**	-
Co-requisites module	None	**Semester**	-

Module Aims, Learning Outcomes, Indicative Contents and Brief Description أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية مع وصف مختصر	
Module Aims أهداف المادة الدراسية	The aim of this module is to help students learn the basics of engineering drawing and how to use AutoCAD for both 2D and 3D designs. Students will: (This statement integrates Bloom's levels) 1. **To understand** key drawing rules and symbols used in engineering. 2. **To apply** AutoCAD tools to create 2D and 3D drawings. 3. **To analyze** technical drawings and design needs. 4. **To evaluate** if drawings meet design and engineering standards. 5. **To create** clear and accurate engineering drawings for real-world use
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	By the end of this module, students will be able to: 1. **Understand** the basic principles, symbols, and standards used in engineering drawings. 2. **Use** AutoCAD software to create and edit 2D and 3D engineering drawings. 3. **Read and interpret** technical drawings for electrical and mechanical systems. 4. **Analyze** design requirements and choose the right drawing methods. 5. **Check and evaluate** drawings to ensure accuracy and compliance with standards. 6. **Create** complete and professional engineering drawings suitable for real engineering tasks.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following: (90hrs) • Introduction to Drawing Equipment (12hrs) • Geometrical Construction (24hrs) • Orthographic Projection (18hrs) • Sectional views(12hrs)

	• Isometric Projections(18hrs) • Dimensioning(6hrs)
Course Description	This module introduces students in Electrical and Mechanical Engineering to the principles and practices of technical drawing using AutoCAD software. The course emphasizes the creation, interpretation, and analysis of engineering drawings in both 2D and 3D formats. Students will learn how to produce accurate and professional technical drawings that meet industry standards, including orthographic projections, sectional views, dimensioning, tolerances, and detailed component drawings
Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	This module will be taught in a **computer lab** using a mix of short lectures, software demonstrations, and hands-on practice. • Each class will begin with a **brief lecture using PowerPoint slides** to explain the topic. • Then, the instructor will give a **live demonstration** using **AutoCAD** on the projector (data show) to show how the drawings are created. • After the demonstration, students will **practice the same tasks** on their own computers, with help and feedback from the instructor. • The lessons will move step-by-step from basic 2D drawings to more advanced 3D models and engineering applications. • Students will also complete **small tasks and a final project** to apply what they've learned. • **Ongoing feedback** and support will be given during the lab sessions to help students improve their work.

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل **In class lectures** **In class tests**	48	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	3.2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل **Library, dorm, home memorizing** **Prepartion for tests** **Homeworks**	102	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	6.8
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	150		

Module Evaluation
تقييم المادة الدراسية

		Time (hr)	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	2	30% (30)	Week 3, 6 , 9 ,13	LO #2, 5, 8 and 4
	Assignments	6	10% (10)	All	LO # 1-14
Summative assessment	**Midterm Exam**	2	10% (10)	Week 7	LO # 1-6
	Final Exam	3	50% (50)	Week 16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

Week 1	Introduction to engineering drawing and AutoCAD interface
Week 2	Basic 2D drawing tools: lines, circles, rectangles, and shapes
Week 3	Editing tools: trim, extend, offset, copy, move, rotate, etc.
Week 4	Dimensioning and annotation in 2D drawings
Week 5	Orthographic projection: front, top, and side views
Week 6	Sectional views and hatching
Week 7	Midterm Exam
Week 8	Introduction to 3D drawing: UCS, isometric views
Week 9	3D modeling tools: extrude, revolve, loft, sweep
Week 10	Creating and editing 3D mechanical parts

Week 11	Creating 3D electrical layouts and panels
Week 12	Working with layers, blocks, and templates
Week 13	Plotting, printing, and file management
Week 14	Mini project work: applying 2D and 3D skills
Week 15	Final project submission and review
Week 16	Final Exam

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Introduction to engineering drawing and AutoCAD interface
Week 2	Basic 2D drawing tools: lines, circles, rectangles, and shapes
Week 3	Editing tools: trim, extend, offset, copy, move, rotate, etc.
Week 4	Dimensioning and annotation in 2D drawings
Week 5	Orthographic projection: front, top, and side views
Week 6	Sectional views and hatching
Week 7	Midterm Exam
Week 8	Introduction to 3D drawing: UCS, isometric views
Week 9	3D modeling tools: extrude, revolve, loft, sweep
Week 10	Creating and editing 3D mechanical parts
Week 11	Creating 3D electrical layouts and panels
Week 12	Working with layers, blocks, and templates
Week 13	Plotting, printing, and file management
Week 14	Mini project work: applying 2D and 3D skills
Week 15	Final project submission and review
Week 16	Final Exam

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Engineering Drawing, Abdul-Rassul Abdul-Hussain, University of Technology, 1986.	Yes
Recommended Texts	1. Simmons, C. H., Phelps, N., & Maguire, D. E. (2012). *Manual of engineering drawing: Technical product specification and documentation to British and international standards* (4th ed.). Butterworth-Heinemann. 2. Reddy, K. V. (2008). Textbook of engineering drawing (2nd ed.). C.R. Engineering College.	No
Websites	https://www.scribd.com/document/855868385/Engineering-Drawing	

APPENDIX:

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	مقبول بقرار	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required
Note:				

NB 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.

	Ministry of Higher Education and Scientific Research - Iraq University of Tikrit College of Engineering-Shirqat Departments of Engineering collage	

MODULE DESCRIPTOR

وصف المادة الدراسية

Module Information معلومات المادة الدراسية				
Module Title	**COMPUTER**		**Module Delivery**	
Module Type	**CORE**		☒ Theory ☐ Lecture ☒ Lab ☐ Tutorial ☐ Practical ☐ Seminar	
Module Code	**UOT003**			
ECTS Credits	**6**			
SWL (hr/sem)	**150**			
Module Level	**1**	**Semester (s) offered**		**1**
Administering Department	**Electrical**	**College**	**Engineering- Shirqat**	
Module Leader	**DiaaAl-Din Ali Hamid**	**e-mail**	diaa@tu.edu.iq	
Module Leader's Acad. Title	**Asst Prof**	**Module Leader's Qualification**		**MSc**
Module Tutor	**Diaa Al-Din Ali Hamid**	**e-mail**	diaa@tu.edu.iq	
Peer Reviewer Name	**Adnan Ali Abdullah**	**e-mail**	adnan.ali23@tu.edu.iq	
Review Committee Approval	**01/06/2025**	**Version Number**		2.0

Relation With Other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None	**Semester**	-
Co-requisites module	None	**Semester**	-
Module Aims, Learning Outcomes, Indicative Contents and Brief Description أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية مع وصف مختصر			
Module Aims أهداف المادة الدراسية	1. Utilize the computer for fundamental tasks. 2. Identify and discuss the hardware components of the computer system. 3. Creating documents using a word processor and creating presentations. 4. Conducting research on the Internet. 5. An introduction of Artificial Intelligence. 6. An introduction to Python Programming.		
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	By the end of the module, students should be able to: **LO1.** Understand computer hardware, software, and operating systems **LO2.** Use Microsoft Word, Excel, and PowerPoint effectively **LO3.** Utilize internet and cloud tools for academic purposes **LO4.** Understand basic programming concepts **LO5.** Write simple Python programs using variables, conditions, loops, and functions		
Indicative Contents المحتويات الإرشادية	Indicative contents include the following. Introduction to Computer and Computer Components Operating System and Graphical User Interface (GUI) Creating Documents (Word Processing) and Spread Sheet Presentation Software Introduction to Internet and Web Browsers Communications and Emails Introduction to Cloud Computing and Services Introduction to Programming and Introduction to Python Python Basics, Control Structures, Functions and Data Structures		

Course Description	Computer Proficiency is an inevitable part of electrical engineering as well as other education sectors. The course also introduces students to the fundamentals of computing, including the use of a variety of different hardware and software components. There is no prerequisite knowledge in either programming or computer science.

Learning and Teaching Strategies

استراتيجيات التعلم والتعليم

Strategies	The teaching of the course is delivered through a combination of lectures, exercises, and laboratory work.

Student Workload (SWL)

الحمل الدراسي للطالب

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	63	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4.2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	87	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	5.8
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	150		

Module Evaluation

تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	4	20 % (20)	3, 6, 9, 12	All LO
	Assignments	4	5% (5)	Continuous	All LO
	Lab.	12	10% (10)	Continuous	All LO
	Lab Report	12	5% (5)	Continuous	All LO
Summative assessment	Midterm Exam	2 hr	10% (10)	7	LO # 1-5
	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 Computer
Week 2	• Computer Components
Week 3	• Operating System and Graphical User Interface (GUI)
Week 4	• Creating Documents (Word Processing)
Week 5	• Spread Sheet
Week 6	• Presentation Software
Week 7	• Introduction to Internet and Web Browsers
Week 8	• Communications and Emails and midterm exam
Week 9	• Introduction to Cloud Computing and Services
Week 10	• Introduction to Programming
Week 11	• Introduction to Python
Week 12	• Python Basics
Week 13	• Control Structures
Week 14	• Functions
Week 15	• Data Structures
Week 16	**Final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	• Computer hardware identification and basic operations
Week 2	• Computer components, ports, and peripherals practice
Week 3	• Operating system usage and file management
Week 4	• Word processing: document creation and formatting
Week 5	• Spreadsheet operations: formulas, functions, and charts
Week 6	• Presentation creation and slide design
Week 7	• Internet usage and web browsing techniques
Week 8	• Email creation, communication, and collaboration tools
Week 9	• Cloud services: Google Docs, Sheets, Drive, and Meet
Week 10	• Introduction to programming environment
Week 11	• Python installation and basic program execution
Week 12	• Python variables, data types, and input/output
Week 13	• Python conditional statements and loops
Week 14	• Python functions implementation
Week 15	Preparing for final exam

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Stormy Attaway, 2012, "**MATLABA Practical Introduction to Programming and Problem Solving**" , 2nd ed, Elsevier Inc., New York, USA, ISBN 978-0-12-385081-2.	No

Recommended Texts	1. Essential Microsoft Office 2010™ Tutorials for Teachers by Bernard John Poole. 2. Learning Microsoft Office Excel 2003 J Fulton – 2004 3. Microsoft Office 2010 Paperback – 29 Jan 2013 by Bittu Kumar New Yourk, ISBN 1-58488-262-X.	No
Websites	https://cae.tu.edu.iq/ed/electronic-lectures.html	

APPENDIX:

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	مقبول بقرار	(45-49)	More work required but credit awarded
	F - Fail	راسب	(0-44)	Considerable amount of work required

	Ministry of Higher Education and Scientific Research - Iraq University of Tikrit College of Engineering-Shirqat Departments of Engineering collage	

MODULE DESCRIPTOR

وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	Physical Electronic			**Module Delivery**	
Module Type	CORE			☒ Theory ☐ Lecture ☐ Lab ☒Tutorial ☐ Practical ☐ Seminar	
Module Code	TUSHEE1103				
ECTS Credits	6				
SWL (hr/sem)	150				
Module Level	1		**Semester (s) offered**		1
Administering Department	Electrical		**College**	Engineering- Shirqat	
Module Leader	Abdulqader Ali Hasan		**e-mail**	abdulkader.ali@tu.edu.iq	
Module Leader's Acad. Title	Assistant Teacher		**Module Leader's Qualification**		MSc
Module Tutor	Abdulqader Ali Hasan		**e-mail**	abdulkader.ali@tu.edu.iq	
Peer Reviewer Name			**e-mail**		

Review Committee Approval	01/06/2023	**Version Number**	1.0

Relation With Other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None	**Semester**	-
Co-requisites module	None	**Semester**	-
Module Aims, Learning Outcomes, Indicative Contents and Brief Description أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية مع وصف مختصر			
Module Aims أهداف المادة الدراسية	1. Understand Energy levels and atomic structure. 2. Learn .Electrical conduction in metals. 3. Understand Semiconductors materials (Si, Ge and compound semiconductors). 4. Learn Semiconductor p-n junction. 5. Learn Diode circuit applications. 6. Knowledge Other types of semiconductor diodes. 7. understanding the concepts of Avalanche breakdown, Zener breakdown and zener applications.		
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	On successful completion of the course students will be able to: **LO1.** Explain The atom, models, wave nature of light, dual nature of matter, wave function, energy-band theory of metals. **LO2.** Explain insulators and semiconductors, crystal structure, ionic, covalent and metallic bonding, energy hand of crystals. **LO3.** Internal structure of materials cell, packing miller indices, crystal planes and directions, braggs law and x - ray diffraction, electronic ballistics. **LO4.** Mobility and conductivity, energy distribution of electrons, fermi level, work function. **LO5.** Understanding Semiconductors materials (Si, Ge and compound semiconductors), extrinsic semiconductors. **LO6.** Explain the fermi - level in semi-conductor, diffusion and carrier life time, Hall effect. **LO7.** Understanding and Analyze the p-n junction in equilibrium, current-voltage characteristics. **LO8.** Understanding the charge-control description of a diode transition and diffusion capacitances.		

	LO9. Explain diode switching times, diode models, small – signal model and load line concept. **LO10.** Explain and Analyze the Rectifiers, clipping circuits, clamping circuits and wave form generation. **LO11.** Understanding the Varactor diode, tunnel diode, photodiode and photovoltaic(solar) cell, Light emitting diode, principle and operation of semiconductor laser, metal Electronic semiconductor diode **LO12.** zener diode, zener diodes voltage regulators
Indicative Contents المحتويات الإرشادية	Indicative contents include the following. **Part A: (26 Hours)** 1. Introduction to Materials. Insulators, semiconductors, conductors. (4 hrs). 2. Mobility and conductivity, energy distribution of electrons, fermi level, work function. (4 hrs). 3. The Semiconductor Band Model -- key properties and features (4 hrs). 4. Internal structure of materials cell, packing miller indices, crystal planes and directions, braggs law and x – ray diffraction, electronic ballistics(6hrs). 5. Carrier Statistics (2 hrs). 6. Charge Transport in Semiconductors. (6 hrs). **Part B: (34 hours)** 7. Ambipolar Transport in Semiconductors (6 hrs) 8. Semiconductor Junctions -- Metal-semiconductor junctions (6 hrs). 9. PN junctions & Design (6 hrs). 10. P-N junction diode characteristics, Applications and types (6 hrs). 11. Zener diode characteristics and applications (6 hrs) . 12. Course Summary (integrating all course components) (4 hrs).
Course Description	This course aims to teach the fundamentals of discrete semiconductor devices and their applications, the chemical, electronic, and physical properties of semiconductors are examined. Basic operating principles and modulus of semiconductor devices including the p-n junction, p-n junction bias, the barrier potential. The physical basis of electronic devices and their applications in analog systems. Diodes and their properties are explored. Basic models for diodes including light-Emitting diode, photodiode, tunnel diode, schottky diode, laser diode, solar cell diode and zener diode. The use of semiconductors devises in digitals circuits, and optoelectronics applications are analyzed.
Learning and Teaching Strategies استراتيجيات التعلم والتعليم	

Strategies	The teaching of the course is delivered through a combination of lectures, HomeWorks and assignments work.

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	63	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4.2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	87	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	5.8
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	150		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	4	30 % (30)	3, 6, 9, 12	All LO
	Assignments	4	10% (10)	Continuous	All LO
	Lab.				
	Report				
Summative assessment	**Midterm Exam**	2 hr	10% (10)	7	LO # 1-5
	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 physical electronic.
Week 2	Quantum behavior of waves and particles.
Week 3	Electronic structure of atoms in solids and energy bands system and the fermi energy level.
Week 4	Intrinsic semiconductors, Crystal structure of an intrinsic semiconductor, Carrier concentration in an intrinsic semiconductor, Electrical conductivity.
Week 5	Extrinsic semiconductor , Type and crystal structure, Properties of Extrinsic semiconductor
Week 6	Electrical conductivity and temperature dependence in Extrinsic semiconductor.
Week 7	Semiconductor measurements, The hall effect experiment. .
Week 8	Introduction of the P-N junction ,
Week 9	Formation of the P-N junction , Types of P-N Junction construction.
Week 10	P-N junction with no external voltage connection (zero bias).
Week 11	P-N junction with external voltage connection (bias).
Week 12	Characteristics of the P-N junction diode.
Week 13	P-N junction diode breakdown mechanisms, Degenerate P-N junction.
Week 14	Types of P-N junction diodes
Week 15	Preparing for Final Exam
Week 16	**Final Exam**

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Fundamentals of Solid State Engineering,2nd Edition-by Manigeh Razeghi, Northwestern University Evatson, IL, UAE.	No
Recommended Texts	electronic-devices-9th-edition-by-floyd.pdf838983133.	No
Websites	https://cae.tu.edu.iq/ed/electronic-lectures.html	

APPENDIX:

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	مقبول بقرار	(45-49)	More work required but credit awarded
	F - Fail	راسب	(0-44)	Considerable amount of work required
Note:				

NB 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.

	Ministry of Higher Education and Scientific Research - Iraq University of Tikrit College of Engineering-Shirqat Department of Electrical Engineering	

MODULE DESCRIPTOR

وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	اللغة العربية ١ **- Arabic Language 1**			**Module Delivery**	
Module Type	**BASIC**			**Theory** **Tutorial**	
Module Code	**UOT001**				
ECTS Credits	2				
SWL (hr/sem)	**50**				
Module Level	1		**Semester (s) offered**	1	
Administering Department	Electrical Engineering		**College**	Al Shirqat Engineering	
Module Leader	Ahmed Jasim Shihab		**e-mail**	ahmed.jassem.shihab@tu.edu.iq	
Module Leader's Acad. Title	Lecturer		**Module Leader's Qualification**	MA	
Module Tutor	Ahmed Jasim Shihab		**e-mail**	ahmed.jassem.shihab@tu.edu.iq	
Peer Reviewer Name	Ali Hussain Hadees		**e-mail**		

Review Committee Approval	01/06/2023	**Version Number**	3.0

Relation With Other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module		**Semester**	
Co-requisites module		**Semester**	-

Module Aims, Learning Outcomes, Indicative Contents and Brief Description أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية مع وصف مختصر	
Module Aims أهداف المادة الدراسية	١- تعريف الطالب بأهمية اللغة العربية ومكانتها العلمية والثقافية. ٢- تنمية قدرة الطالب على قراءة وفهم النصوص القرآنية والحديثية وفهم معانيها العامة. ٣- إكساب الطالب معرفة أساسية بمفاهيم النحو العربي وتمكينه من تطبيقها في الاستخدام اللغوي السليم. ٤- تعريف الطالب بأسس الأدب الجاهلي والإسلامي والقيم الإنسانية التي يتضمنها. ٥- تنمية مهارات الطالب في الكتابة الصحيحة من حيث الإملاء وعلامات الترقيم. ٦- تدريب الطالب على استخدام المعاجم العربية لاستخراج معاني الألفاظ. ٧- تصحيح الأخطاء اللغوية الشائعة في الاستعمال اليومي والأكاديمي. ٨- تنمية مهارة الطالب في التعبير اللغوي السليم شفهيًا وكتابيًا.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	عند إتمام المادة بنجاح، يُتوقع من الطالب أن يكون قادرًا على: ١. التعرّف على مكانة اللغة العربية وأهميتها العلمية والثقافية. ٢. فهم المعاني العامة للنصوص القرآنية والحديث الشريف المقررة. ٣. تمييز أقسام الكلام الأساسية وقواعدها النحوية البسيطة. ٤. تطبيق قواعد نحوية وصرفية أساسية في الكتابة الصحيحة. ٥. قراءة نصوص أدبية مختارة قراءة صحيحة وفهم مضامينها العامة. ٦. استخدام المعاجم العربية لاستخراج معاني الألفاظ. ٧. كتابة جمل وفقرات خالية من الأخطاء الإملائية الشائعة. ٨. توظيف علامات الترقيم توظيفًا صحيحًا في التعبير الكتابي. ٩. تصحيح الأخطاء اللغوية الشائعة في الاستعمال اليومي. ١٠. التعبير عن أفكاره بلغة عربية سليمة وبأسلوب واضح.
Indicative Contents المحتويات الإرشادية	أهمية اللغة العربية ومكانتها القرآن الكريم: آيات مختارة من سورتي البقرة والحج الحديث النبوي الشريف (مختارات أخلاقية وتربوية) الأدب الجاهلي والإسلامي شعر عنترة بن شداد والقيم الإنسانية في الشعر أقسام الكلام المعرفة والنكرة المبتدأ والخبر النواسخ - الفاعل ونائب الفاعل الميزان الصرفي

	تصريف الأفعال من حيث الصحة والاعتلال والتجرد والزيادة الجموع والمشتقات المهارات اللغوية الأساسية الحروف الشمسية والقمرية علامات الترقيم - كتابة الهمزة بأنواعها المعاجم العربية ومناهج ترتيبها استخراج الألفاظ من المعجم الأخطاء اللغوية الشائعة
Course Description	يهدف هذا المقرر إلى تزويد الطلبة المرحلة الأولى من الأقسام غير الاختصاص بأساسيات اللغة العربية، من خلال التعريف بمكانتها وأهميتها في الحياة العلمية والثقافية، وتمكينهم من فهم النصوص القرآنية والحديثية المختارة وفهم دلالاتها العامة. كما يتناول المقرر مبادئ الأدب العربي القديم، ولا سيما الأدب الجاهلي والإسلامي، مع دراسة نماذج شعرية مختارة تبرز القيم الإنسانية والأخلاقية. ويعنى المقرر بتقديم قواعد نحوية وصرفية أساسية، إضافة إلى تنمية المهارات اللغوية والإملائية، وتدريب الطلبة على استخدام المعاجم العربية وتصحيح الأخطاء اللغوية الشائعة، بما يسهم في تطوير قدرتهم على التعبير السليم الشفهي والكتابي..
Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	1- المحاضرات النظرية 2- الامتحانات الشهرية 3- الواجبات البيتية 4- التقارير

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	33	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	2.2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	17	**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 (hr)	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative	**Quizzes**	4	30% (30)	All	LO #1-, 3

assessment	**Assignments**	4	10% (10)	All	LO # 1, 2, 3, 4, and 5
Summative assessment	**Midterm Exam**	2	10% (10)	7	LO # 1-5
	Final Exam	3	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	●التعريف بالمقرر وأهمية اللغة العربية وأقسام الكلام
Week 2	●القرآن الكريم: آيات مختارة من سورة البقرة ودلالاتها اللغوية
Week 3	●القرآن الكريم: آيات مختارة من سورة الحج ودلالاتها البلاغية والتربوية
Week 4	●الحديث النبوي الشريف وأثره في تهذيب اللغة والسلوك
Week 5	●الأدب الجاهلي وخصائصه الفنية والفكرية
Week 6	●شعر عنترة بن شداد والقيم الإنسانية في الشعر الجاهلي والإسلام والشعر
Week 7	●المعرفة والنكرة والمبتدأ والخبر
Week 8	●النواسخ والفاعل ونائب الفاعل
Week 9	●الميزان الصرفي وتصريف الأفعال من حيث الصحة والاعتلال والتجرد والزيادة
Week 10	●الجموع والمشتقات
Week 11	●المهارات اللغوية: الحروف الشمسية والقمرية وعلامات الترقيم
Week 12	●المهارات اللغوية: كتابة الهمزة (الأولى والمتوسطة والمتطرفة)
Week 13	●المعاجم العربية والمدارس المعجمية ومناهج ترتيبها
Week 14	●استخراج الألفاظ من المعاجم والأخطاء اللغوية الشائعة
Week 15	●المراجعة العامة والتقويم النهائي

Week 16	Final Exam

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	جامع الدروس العربية – مصطفى الغلاييني	نعم
Recommended Texts	1- جواهر البلاغة – احمد مطلوب 2- لسان العرب- ابن منظور-	كلا
Websites		

APPENDIX:

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	مقبول بقرار	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note:

NB 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.

	Ministry of Higher Education and Scientific Research - Iraq University of Tikrit College of Engineering-Shirqat Departments of Engineering collage	

MODULE DESCRIPTOR

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	**UOT002**			
ECTS Credits	**2**			
SWL (hr/sem)	**50**			
Module Level	1	**Semester (s) offered**		**1**
Administering Department	**Electrical**	**College**	**Engineering- Shirqat**	
Module Leader	**Ayyash Ahmed Abdullah**	**e-mail**	ayyashAbdullah@tu.edu.iq	
Module Leader's Acad. Title	**Assistant Lecturer**	**Module Leader's Qualification**		**MSc.**
Module Tutor	**Ayyash Ahmed Abdullah**	**e-mail**	ayyashAbdullah@tu.edu.iq	
Peer Reviewer Name	Asst Prof. Dr. Ayad Atiyah Abdulkafi	**e-mail**	ayad.atiyah@tu.edu.iq	

Review Committee Approval	01/06/2025	**Version Number**	2.0

Relation With Other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None	**Semester**	-
Co-requisites module	None	**Semester**	-
Module Aims, Learning Outcomes, Indicative Contents and Brief Description أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية مع وصف مختصر			
Module Aims أهداف المادة الدراسية	1.Use the language with accuracy and fluently 2-Integrate themes, structures, function vocabulary and pronunciation 3-Make use of language in real life. 4-Familiarize themselves with conversational language, grammar in communication listening activities high interested reading passages		
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	On successful completion of the course students will be able to understand: **LO1.** Use the language with accuracy and fluently Principle operation of dc generator. **LO2.** Integrate themes, structures, function vocabulary and pronunciation Parallel operation of dc generators.. **LO3.** Make use of language in real life. Analyze Characteristics and performance of dc motors. **LO4.** Familiarize themselves with conversational language, and grammar in communication listening activities high interested in reading passages		
Indicative Contents المحتويات الإرشادية	Indicative contents include the following. The course aims to develop communicative competence in English for intercultural contexts by teaching language items and communicative strategies essential for such scenarios, while at the same time giving students ample chances to output such items. The aims of this course are reflected in the content, which contains several themes, such as cultural awareness, intercultural awareness, and English as a global language. Indicative content includes understanding the uniqueness of your own culture and other cultures, as well as being aware of the role culture plays in communication in English as a global language. In addition, this course allows for discussions about what it		

	means for English to be a global language of communication and how misunderstandings and miscommunications when using English occur.
Course Description	This course is designed to give the students the opportunity to practice different language skills like reading, listening, speaking, and writing.
Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The teaching of the course is delivered through a combination of lectures, online lectures, tutorials, and exercises,.

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	33	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	2.2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	17	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	1.1
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	50		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	٤	10 % (10)	٣, 6, 9, 12	LO #2 ,5 ,8, 11
	Assignments	٤	15% (15)	Continuous	All LO
	Lab.		% (00)	Continuous	All LO

	Report	8	15% (15)	Continuous	All LO
Summative assessment	**Midterm Exam**	1 hr	10% (20)	7	LO # 1-6
	Final Exam	2 hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Alphabet: greeting and leave-taking names ma d address Numbers 0 to 10 and email address
Week 2	Possessions of classroom objects personal items and locations
Week 3	Cities and countries, adjectives of personality, and apprentice numbers
Week 4	Clothing .colors and weather seasons clock time and the day's everyday activities
Week 5	Housed and apartments rooms frontiers jobs and workplace
Week 6	Basic food breakfast foods and meals
Week 7	Sports abilities and talent
Week 8	**Midterm Exam**
Week 9	Months and dates of birthdays holidays festivals and medication
Week 10	Stores and things you can buy there and tourist attraction
Week 11	Weekends chores and fun activities and summer activities
Week 12	Biographical information years and school days
Week 13	Locations telephone calls invitations going out and with friend activities
Week 14	INTERCHANGES Activities (all Unites)
Week 15	**Self- assessment**
Week 16	**Final Exam**

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Richards, Ak C(1999)New interchange U.k. New Interchange Book 5th edition	Yes
Recommended Texts	Mark Ibbotson Cambridge English for Engineering	No
Websites	**https://itrdc.uokufa.edu.iq/**	

APPENDIX:

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	مقبول بقرار	(45-49)	More work required but credit awarded
	F - Fail	راسب	(0-44)	Considerable amount of work required
Note:				

NB 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.

	Ministry of Higher Education and Scientific Research - Iraq University of Tikrit College of Engineering Shirqat Department of Engineering collage	

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**BASICS OF ELECTRICAL ENGINEERING**			**Module Delivery**	
Module Type	**CORE**			☒ Theory ☐ Lecture ☒ Lab ☐ Tutorial ☐ Practical ☐ Seminar	
Module Code	**TUSHEE1200**				
ECTS Credits	**8**				
SWL (hr/sem)	**200**				
Module Level		1	**Semester of Delivery**		2
Administering Department		Electrical Engineering	**College**	Engineering	
Module Leader	Abdullah Ahmed Alwan		**e-mail**	abdullahahmed@tu.edu.iq	
Module Leader's Acad. Title		Asst. Prof.	**Module Leader's Qualification**		MSc.
Module Tutor			**e-mail**		
Peer Reviewer Name		Ahmed Saad Namis	**e-mail**	ahmed.alnames@tu.edu.iq	
Scientific Committee Approval Date		01/06/2025	**Version Number**		2.0

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

Co-requisites module	None	Semester	

Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

Module Aims أهداف المادة الدراسية	1. To 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 D.C. electrical circuits. 4. This is the basic subject for all D.C. electrical circuits. 5. To understand Kirchhoff's current and voltage Laws problems. 6. To perform mesh and Nodal analysis. 7. To understand superposition, Thevenin, Norton , Max power transfer and millman Theorems in D.C. circuits. 8. To perform the basic circuit elements. 9. To understand the operations of sinusoid and phasors in an electric circuit.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Recognize how electricity works in electrical circuits. 2. List the various terms associated with electrical circuits. 3. Summarize what is meant by a basic electric circuit. 4. Discuss the reaction and involvement of atoms in electric circuits. 5. Describe electrical power, charge, and current. 6. Define Ohm's law. 7. Identify the basic circuit elements and their applications. 8. Explain the two Kirchhoff's laws used in D.C. circuit analysis. 9. Explain mesh and Nodal analysis in D.C. circuits. 10. Explain superposition, Thevenin, Norton , Max power transfer and millman Theorems in D.C. circuits. 11. Identify the basic circuit elements and their applications. 12. Discuss the operations of sinusoid and phasors in an electric circuit.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following.(120hrs) 1. Basic concept and units [20hrs] 2. Analysis of dc circuits [60hrs] 3. Capacitance and Inductors in D.C. Circuits [20hrs] 4. Alternation quantities [20hrs]
Course Description	An introductory course to the fundamentals and basic principles of DC and AC circuits. Topics include: resistance, voltage, current, Ohm's Law, Kirchhoff's Laws, power, superposition, network theorems, Thevenin's and Norton's Theorems, maximum power transfer, introduction to AC, capacitors and inductors. Laboratory hours complement class work.

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

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	153	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	10.2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	47	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	3.13
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**	4	20% (20)	3,6, 9 ,13	LO #1, 2, 5, 8, and 9
	Assignments	5	5% (5)	3 ,6, 9,11,14	LO # 3,6, 9 ,11 and 14
	Lab.	14	10% (10)	Continuous	ALL LO
	Report	14	5% (5)	13	ALL LO
Summative assessment	**Midterm Exam**	2hrs	10% (10)	7	LO 1-6
	Final Exam	3hrs	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Electricity & atomic structure of substance, current and current density current flow, electric circuit, E.M.F & potential difference & International system of unit, abbreviation for multiples & submultiples, quantities derived from SI units, units of force-energy torque and power, relation between energy and heat..
Week 2	Electric units, efficiency and percentage efficiency, Ohm's law, resistivity & conductivity, temperature effect & Internal resistance of a source, open circuit & short circuit, Series circuits, KVL..
Week 3	Parallel circuits, KCL, Series-parallel circuits. Source conversion, determinants, Mesh analysis method.
Week 4	Nodal analysis, Bridge network, star – delta conversion. Mid-term Exam +Superposition theorem.
Week 5	Thevenin's theorem, Norton's theorem. Maximum power transfer, Millman's theorem, Substitution theorem.
Week 6	Capacitance, charging phase, discharging phase, capacitor in series and parallel, energy stored by capacitor. Self-inductance, R-L: storage cycle and decay phase, Inductors in series and parallel, energy stored by an inductor.
Week 7	Magnetic field, fields due to electrical current, Generation of single phase voltage. relation between time and angle, Max- average value.
Week 8	rms value of alternating and sinusoidal voltage and current, phasor quantities. Voltage and current relation in pure resistive – inductive and capacitive circuits , Reactance and impedance
Week 9	Phasor diagram , Series circuits , parallel circuits. Series-parallel circuits, power calculation in a.c. circuits, power factor
Week 10	Evaluation of impedance, KVL,KCL, Star-delta conversion. Mesh analysis, Nodal analysis.
Week 11	Dependent and independent sources, Superposition theorem. Thévenin theorem, Norton's theorem
Week 12	Mid-term Exam + Maximum power transfer. Milkman's theorem, Substitution theorem, complex power.
Week 13	Power calculation, power factor correction. Series resonance, quality factor, selectivity, Half power, frequency and bandwidth.
Week 14	parallel resonance, quality factor, selectivity, Half power, frequency and bandwidth, Series-parallel resonance circuits. Magnetic field, direction of magnetic field, Electromagnetic induction, Faraday's law, magnitude of induced e.m.f.
Week 15	Magnetic circuits, series and parallel circuits, Series-parallel circuits. Kirchoff's law for magnetic circuits, Hysteresis and factor effect on its loop, hysteresis and eddy losses, Force between two magnetic poles, magnetic pull between two iron surface.
Week 16	**final Exam**

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

Week 1	Lab 1: Resistors type and measurements devices
Week 2	Lab 2: Ohm's law
Week 3	Lab 3: KVL and KCL
Week 4	Lab 4: Bridge network, star – delta conversion
Week 5	Lab 5: Superposition theorem
Week 6	Lab 6: Thevenin's theorem and Norton's theorm
Week 7	Lab 7: Maximum power transfer
Week 8	Lab 8: Oscilloscope
Week 9	Lab 9: Phasor diagram
Week 10	Lab 10: RLC in AC circuits
Week 11	Lab 11: KVL and KCL in AC circuits
Week 12	Lab 12: Thevenin and max. power transfer in AC circuits
Week 13	Lab 13: Power calculation in AC circuits
Week 14	Lab 14: Series resonance

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Introductory circuit analysis, Robert L. Boylestad, 10th edition, Prentice Hall, March 4, 2002.	Yes
Recommended Texts	DC Electrical Circuit Analysis: A Practical Approach Copyright Year: 2020, dissidents.	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.

	Ministry of Higher Education and Scientific Research - Iraq University of Tikrit College of Engineering-Shirqat Departments of Engineering collage	

MODULE DESCRIPTOR

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	**TUSHEE1201**			
ECTS Credits	**8**			
SWL (hr/sem)	**200**			
Module Level	١	**Semester (s) offered**	٢	
Administering Department	**Electrical**	**College**	**Engineering- Shirqat**	
Module Leader	**Diadeen Ali Hameed**	**e-mail**	diaa@tu.edu.iq	
Module Leader's Acad. Title	**Asst Prof**	**Module Leader's Qualification**	**PhD**	
Module Tutor	**Diadeen Ali Hameed**	**e-mail**	diaa@tu.edu.iq	
Peer Reviewer Name	**Asst Prof Dr. Khamees Kh. Hasan**	**e-mail**	kaljomaily@tu.edu.iq	

Review Committee Approval	01/06/2023	**Version Number**	1.0

Relation With Other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None	**Semester**	-
Co-requisites module	None	**Semester**	-
Module Aims, Learning Outcomes, Indicative Contents and Brief Description أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية مع وصف مختصر			
Module Aims أهداف المادة الدراسية	1. To understand the binary number system 2. To understand the operation of number systems conversion from decimal to binary and from binary to decimal. 3. To understand the stricture of basic logic gate 4. To understand the operation theory of basic logic gate 5. To understand how to interface between logic gate and other logic gate 6. To understand how to use the logic gates in simple applications 7. To understand the operation theory and its basic application circuits of 4bit comparator. 8. To understand the operation theory and its basic application circuits of half adder, full adder, half subtractor and full subtractor. 9. To understand the operation theory and its basic application circuits of encoder circuit, decoder circuit, multiplexer and demultiplexer. 10. To understand the operation theory and its basic application circuits of Flip-flop circuit, Counters and Shift Register circuits.		
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	On successful completion of the course students will be able to: **LO1.** Count in the binary number system. **LO2.** Convert from decimal to binary and from binary to decimal. **LO3.** Carry out arithmetic operations with signed binary **LO4.** Describe the operation of the inverter, the AND gate, OR gate, NAND gate and the NOR gate **LO5.** Express the operation of NOT, AND, OR, NAND, and NOR gates with Boolean algebra **LO6.** Use logic gates in simple applications **LO7.** Apply the basic laws and rules of Boolean algebra **LO8.** Relate a Boolean expression to a truth table **LO9.** Use a Karnaugh map to simplify Boolean expressions and the truth table functions		

	LO10. Analyze basic combinational logic circuits, such as AND-OR, AND-OR-Invert, exclusive-OR, and exclusive-NOR **LO11.** Design a combinational logic circuit for a given Boolean output expression and truth table **LO12.** Use NAND gates to implement any combinational logic function **LO13.** Use full-adders to implement multibit parallel binary adders **LO14.** Convert from binary to Gray code, and Gray code to binary by using logic devices **LO15.** Apply flip-flops in basic applications **LO16.** Describe the difference between an asynchronous and a synchronous counter **LO17.** Use an up/down counter to generate forward and reverse binary sequences **LO18.** Identify the basic forms of data movement in shift registers
Indicative Contents المحتويات الإرشادية	Indicative contents include the following. **Digital Techniques Theory (60 Hours)** 1. **Number Systems and Arithmetic Operations**: Digital concepts, General number formula: Binary, octal, decimal, hexadecimal and BCD numbers. Numbers conversions, Numbers Arithmetic. 1's and 2's complement of binary numbers. Signed numbers, arithmetic operations with signed numbers. (8 hours) 2. **Logic Gates:** Invertor (NOT), AND, OR, NAND, NOR, X-OR and X-NOR gates. (6 hours) 3. **Boolean Algebra:** Boolean operations and expressions, Law and rules of Boolean algebra, DeMorgans theorems. Boolean analysis of Logic circuits, Canonical and standard forms of Boolean expressions. (6 hours) 4. **Logic Simplification:** Boolean expressions and Truth table, Simplifications using Boolean algebra, The Karnaugh map, Karnaugh map SOP minimization, Karnaugh map POS minimization, Five-variable Karnaugh maps. (8 hours) 5. **Combinational Logic Analysis:** Basic concepts, Implementing Combinational Logic, Universal Property of NAND and NOR gates, Combinational Logic Using NAND and NOR gates. (6 hours) 6. **Functions of Combinational Logic:** Basic Adders, Parallel Binary adder, Comparators, Decoders, Encoders, Multiplexers, Demultiplexes. (8 hours) 7. **Latches and Filp-Flops:** Latches, Edge-Triggered Flip-Flops, Flip-Flop operating Characteristics, Flip-Flop Applications. (6 hours) 8. **Counters and Shift Registers:** Asynchronous counters, Synchronous counters, Up/Down counters, Counter applications, Basic Shift register operations, SISO-SIPO-PISO-PIPO shift registers, Shift Registers Applications. (8 hours) 9. **Brief Review for Main Subjects.** (4 hours)

	B. Digital Techniques Lab (60 Hours) 4 hours for each week
Course Description	This course aims to enable students to be familiar with fundamental concepts and issues, to develop good understanding of basic digital techniques to perform simple analysis and assessment of system performance. This course provides basic concepts reinforced by plentiful illustrations, examples, exercises, and applications. The approach used in this course allows students to master the all-important fundamental concepts before getting into more advanced topics digital techniques.
Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The teaching of the course is delivered through a combination of theory, exercises, and laboratory work.

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	123	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	8.2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	77	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	5.13
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	4	20 % (20)	3, 6, 9, 12	All LO
	Assignments	4	5% (5)	Continuous	All LO
	Lab.	14	10% (10)	Continuous	All LO
	Report	14	5% (5)	Continuous	All LO
Summative assessment	Midterm Exam	2 hr	10% (10)	7	LO # 1-6
	Final Exam	3 hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	Digital Concepts, Decimal Numbers, Binary Numbers, Decimal-to-Binary Conversion, Binary Arithmetic, Complements of Binary Numbers
Week 2	Signed Numbers, Arithmetic Operations with Signed Numbers, Hexadecimal Numbers, Octal Numbers, Binary Coded Decimal (BCD)
Week 3	Logic Gates: The Inverter, The AND Gate, The OR Gate, The NAND Gate, The NOR Gate,
Week 4	Logic Gates: The Exclusive-OR and Exclusive-NOR Gates. Boolean Algebra and Logic Simplification: Boolean Operations and Expressions, Laws and Rules of Boolean Algebra,
Week 5	Boolean Algebra and Logic Simplification: DeMorgan's Theorems, Boolean Analysis of Logic Circuits, Logic Simplification Using Boolean Algebra,
Week 6	Standard Forms of Boolean Expressions, Boolean Expressions and Truth Tables, The Karnaugh Map
Week 7	Karnaugh Map SOP Minimization, Karnaugh Map POS Minimization, The Quine-McCluskey Method
Week 8	Combinational Logic Analysis: Basic Combinational Logic Circuits, Implementing Combinational Logic, The Universal Property of NAND and NOR Gates

Week 9	Combinational Logic Using NAND and NOR Gates. Functions of Combinational Logic: Half and Full Adders, Parallel Binary Adders,
Week 10	Comparators, Decoders, Encoders, Code Converters.
Week 11	Multiplexers (Data Selectors), Demultiplexers. Latches and Flip-Flops: Latches, Flip-Flops
Week 12	Flip-Flop Operating Characteristics, Flip-Flop Applications
Week 13	Counters and Shift Registers: Asynchronous counters, Synchronous counters, Up/Down Counters, Counter Applications,
Week 14	Basic Shift Register Operations, SISO-SIPO-PISO-PIPO Shift Registers, Shift Registers Applications
Week 15	Brief Review for Main Subjects
Week 16	**Final Exam**

Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

	Material Covered
Week 1	Logic gate structure circuit
Week 2	Logic gates circuit
Week 3	Combinational Logic Circuits: 4bits and 9bit Comparator Circuits
Week 4	Combinational Logic Circuits: Half Adder and Full Adder
Week 5	Combinational Logic Circuits: Half Subtractor and Full Subtractor
Week 6	Extended Combinational Logic Circuits: Encoder circuits
Week 7	Extended Combinational Logic Circuits: Decoder circuits
Week 8	Tim Extended Combinational Logic Circuits: Multiplexer Circuits
Week 9	Tim Extended Combinational Logic Circuits: Demultiplexer Circuits
Week 10	Clock Generator Circuits

Week 11	D Flip-Flop Circuit
Week 12	RS Flip-Flop Circuit
Week 13	JK Flip-Flop Circuit
Week 14	Shift Register
Week 15	Brief Review for Main Subjects

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Digital Fundamentals, 8th Edition, Thomas L. Floyd	Yes
Recommended Texts	Fundamentals of Logic Design, 6th_Edition, Charles H. Roth, Jr. Larry L. Kinney	No
Websites	https://cae.tu.edu.iq/ed/electronic-lectures.html	

APPENDIX:

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	مقبول بقرار	(45-49)	More work required but credit awarded
	F - Fail	راسب	(0-44)	Considerable amount of work required

Note:				

NB 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.

	Ministry of Higher Education and Scientific Research - Iraq University of Tikrit College of Engineering-Shirqat Departments of Engineering collage	

MODULE DESCRIPTOR

وصف المادة الدراسية

Module Information معلومات المادة الدراسية				
Module Title	Engineering Mechanics		**Module Delivery**	
Module Type	SUPPORT		☒ Theory ☐ Lecture ☐ Lab ☐Tutorial ☐ Practical ☐ Seminar	
Module Code	TUSHEE1202			
ECTS Credits	6			
SWL (hr/sem)	150			
Module Level	1	**Semester (s) offered**		2
Administering Department	Electrical	**College**	Engineering- Shirqat	
Module Leader	Abdulqader Ali Hasan	**e-mail**	abdulkader.ali@tu.edu.iq	
Module Leader's Acad. Title	Assistant Teacher	**Module Leader's Qualification**		MSc
Module Tutor	Abdulqader Ali Hasan	**e-mail**	abdulkader.ali@tu.edu.iq	
Peer Reviewer Name	Ayad Atiyah Abdulkafi	**e-mail**	ayad_atiyah@tu.edu.iq	

Review Committee Approval	01/06/2023	**Version Number**	1.0

Relation With Other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None	**Semester**	-
Co-requisites module	None	**Semester**	-

Module Aims, Learning Outcomes, Indicative Contents and Brief Description أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية مع وصف مختصر	
Module Aims أهداف المادة الدراسية	8. To provide the students with a foundation of the theory and principles of statics. 9. To study the effects of forces on bodies at rest using Newton's laws of motion. 10. To provide the students with experience in solving problems to determine the forces and moments on structures in static equilibrium. 11. To introduce the students to the engineering applications of mechanics. 12. Learn Active materials & their specification, work and heat in ideal gasses and steam 1st law of thermodynamics practical law in steam and gasses, 2nd law of thermodynamics practical law in steam and gasses. 13. understanding the concepts of Hook's law, tension and compression stress, thin-walled cylinders and spheres, combined stress (Mohr's circle) shear and normal stress.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	On successful completion of the course students will be able to: **LO13.** Apply basic knowledge of mathematics, science and engineering principles to solve technical problems. **LO14.** Design and analyze a system component, or process to meet desired needs in Mechanical Engineering. **LO15.** Design a system and conduct experiments to find suitable solution in the field of mechanical engineering. **LO16.** Identify, visualize, formulate and solve engineering problems in the field of mechanical Engineering. **LO17.** Use the techniques, skills, and modern engineering tools necessary for engineering practice with appropriate considerations for societal, and environmental constraints. **LO18.** Apply their fundamental field skills towards the understanding of the impact of engineering solutions on the society in a global and social context. **LO19.** Impart knowledge of contemporary issues about society and environment.

	LO20. Apply ethical principles and responsibilities during professional practice. **LO21.** Function on multidisciplinary teams as a team member/leader and create user friendly environment. **LO22.** Communicate effectively in oral, written, visual and graphic modes within interpersonal, team, and group environments. **LO23.** Apply the techniques, skills and modern engineering tools necessary for engineering projects. **LO24.** Recognize the need for professional advancement by engaging in lifelong learning.
Indicative Contents المحتويات الإرشادية	Indicative contents include the following. **Part A: Static. (24 Hours)** 13. Introduction to Engineering Mechanics . (2 hrs). 14. Force system, unit's system, parallelogram law, forces + components, resultant of coplanar forces components of force in space, moment of a force, moment of couples, equilibrium. (8 hrs). 15. Free body diagram, coplanar system, analysis of trusses (6 hrs). 16. Centroids & center of gravity – centroids of area, centroids determined by integration, moments of inertia (4hrs). 17. Parallel axes theorem, 2nd moment of area by integration, radius of gyration, moment of inertia of composite area .(4 hrs). **Part B:Dynamics. (12hours)** 18. Kinetics of particle, rectilinear motion, curvilinear motion, rectangular components of curvilinear motion, normal and tangential component of acceleration (6 hrs) 19. Kinetics: Force, mass and acceleration, kinetics of particle newton's 2nd law. (6 hrs) **Part C: Thermodynamics. (14hours)** 20. Introduction, Active materials & their specification (2 hrs). 21. Work and heat in ideal gasses and steam 1st law of thermodynamics practical law in steam and gasses (6 hrs). 22. 2nd law of thermodynamics practical law in steam and gasses. (6 hrs) . **Part D: Strength of Materials. (10hours)** 23. Hook's law, tension and compression stress, thin-walled cylinders and spheres. (5 hrs) 24. Combined stress (Mohr's circle) shear and normal stress, stress in beams (initial principal). (5 hrs)
Course Description	Mechanics is the study of forces that act on bodies and the resultant motion that those bodies experience. With roots in physics and mathematics, Engineering Mechanics is the basis of all the mechanical sciences: civil engineering, materials science and engineering, mechanical engineering and aeronautical and aerospace engineering. Engineering Mechanics provides the "building blocks" of statics, dynamics, strength of materials, and fluid dynamics. Engineering mechanics is the discipline devoted to the solution of

	mechanics problems through the integrated application of mathematical, scientific, and engineering principles. Special emphasis is placed on the physical principles underlying modern engineering design.

Learning and Teaching Strategies

استراتيجيات التعلم والتعليم

Strategies	The teaching of the course is delivered through a combination of class lectures,Class discussions, exercises, and assignments work.

Student Workload (SWL)

الحمل الدراسي للطالب

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	63	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	87	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	5
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	150		

Module Evaluation

تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	4	30 % (30)	3, 6, 9, 12	All LO
	Assignments	4	10% (10)	Continuous	All LO

	Lab.				
	Report				
Summative assessment	**Midterm Exam**	2 hr	10% (10)	7	LO # 1-5
	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 Mechanics.**
Week 2	Resultant of coplanar forces components of force in space, moment of a force, moment of couples.
Week 3	Equilibrium: Free body diagram, coplanar system, analysis of trusses.
Week 4	Friction: Nature of friction, theory of friction, coefficient of friction.
Week 5	Centroids & center of gravity – centroids of area, centroids determined by integration
Week 6	Moments of inertia: Parallel axes theorem, 2nd moment of area by integration, radius of gyration, moment of inertia of composite area.
Week 7	Kinetics of particle, rectilinear motion, curvilinear motion, rectangular components of curvilinear motion. .
Week 8	Normal and tangential component of acceleration, kinetics: Force, mass and acceleration,
Week 9	Kinetics of particle newton's 2nd law.
Week 10	Thermodynamics.
Week 11	Active materials & their specification, work and heat in ideal gasses and steam 1st law of thermodynamics practical law in steam and gasses.
Week 12	2nd law of thermodynamics practical law in steam and gasses.
Week 13	Strength of Materials: Hook's law, tension and compression stress, thin-walled cylinders and spheres.
Week 14	Combined stress (Mohr's circle) shear and normal stress, stress in beams (initial principal)

Week 15	Preparing for Final Exam
Week 16	**Final Exam**

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	1-Engineering Mechanics. Statics.J.L.Meriam,L.G.Krage. 2-Elements of Classical Thermodynamics, A.B.Pippard	Yes No
Recommended Texts	Sandor, B.I.; Roloff, R; et. al. "Mechanics of Solids" Mechanical Engineering Handbook Ed. Frank Kreith Boca Raton: CRC Press LLC, 1999	No
Websites	https://cae.tu.edu.iq/ed/electronic-lectures.html	

APPENDIX:

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	مقبول بقرار	(45-49)	More work required but credit awarded

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

NB 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.

	Ministry of Higher Education and Scientific Research - Iraq University of Tikrit College of Engineering Departments of Engineering collage	

MODULE DESCRIPTOR

وصف المادة الدراسية

Module Information معلومات المادة الدراسية				
Module Title	**Engineering workshops**		**Module Delivery**	
Module Type	**Basic**		**Practical**	
Module Code	**TUSHEE1203**			
ECTS Credits	**4**			
SWL (hr/sem)	**100**			
Module Level	1	**Semester (s) offered**	2	
Administering Department	**Electrical /Mechanical**	**College**	**Engineering- Shirqat**	
Module Leader	**Kamil J. Ali**	**e-mail**	kmil.ali78@tu.edu.iq	
Module Leader's Acad. Title	**Assistant Professor**	**Module Leader's Qualification**	**MSc.**	
Module Tutor	**Kamil J. Ali** **Dr. Ahmed Qais**	**e-mail**	kmil.ali78@tu.edu.iq ahmed_qays@tu.edu.iq	
Peer Reviewer Name	**Kamil J. Ali**	**e-mail**	kmil.ali78@tu.edu.iq	

Review Committee Approval	01/06/2023	**Version Number**	1.0

Relation With Other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None	**Semester**	-
Co-requisites module	None	**Semester**	-

Module Aims, Learning Outcomes, Indicative Contents and Brief Description أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية مع وصف مختصر	
Module Aims أهداف المادة الدراسية	Theoretical and practical training in which the student is scientifically and technically established with the most necessary skills in the field of engineering technology
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	On completion of this course students will be able to: Knowledge of technical skills in the field of industrial safety, measurement, filing, carpentry, welding, mechanical operation, sanitary engineering and the basics of electrical work
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. ● Industrial safety workshop(2 hours) ● Measurement &Marking workshop(2 hours) ● Filing workshop (8 hours) ● Carpentry workshop(8 hours) ● Welding workshop(8 hours) ● Casting workshop(8 hours) ● Machining workshop(8 hours) ● plumbing workshop(8 hours) ● Electrical workshop (8 hours)
Course Description	The engineering workshop course focuses on identifying risks in the work environment and industrial safety guidelines. And training on how to measure and determine, and the use of filing tools and their work. Learn about the types of wood used in carpentry, the process of shaping it, and the use of carpentry tools and machines. Training in welding work, its types, and the process of joining metals by welding. Training on various casting works and training on mechanical operation, which includes turning, milling, and grinding. Training on pipe knowledge, how to connect, sanitary engineering works, and training on the basics of electrical workshops.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The learning and teaching **strategy** is designed to: Carefully cover in lectures the necessary fundamental material and analytical techniques, and demonstrate concepts with appropriate (and where possible practical) examples Allow students adequate time to practice the techniques using a large number of carefully selected tutorial problems.

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	63	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4.2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	37	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	2.4
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	100		

Module Evaluation تقييم المادة الدراسية					
		Time (hr)	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	9	25% (25)	all	LO #1, 2, 3, and 9
	Assignments	9	15% (15)	All	LO # 1, 2, 3, 4, 5 and 9
	Midterm Exam	2	10% (10)	7	LO # 1-5

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

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Industrial safety workshop & Measurement and marking workshop
Week 2	Filing workshop
Week 3	Filing workshop
Week 4	Carpentry workshop
Week 5	Carpentry workshop
Week 6	Welding workshop
Week 7	Welding workshop
Week 8	plumbing workshop
Week 9	plumbing workshop
Week 10	Machining workshop
Week 11	Machining workshop
Week 12	Casting workshop
Week 13	Casting workshop
Week 14	Electrical workshop
Week 15	Electrical workshop
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	Abd fares , Engineering workshops	Yes
Recommended Texts	Technology of Machine Tools , Steve F. Krar & J. William Oswald ,McGraw-Hill Publishing Company , fourth Edition , 1991	No
Websites		

APPENDIX:

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	مقبول بقرار	(45-49)	More work required but credit awarded
	F - Fail	راسب	(0-44)	Considerable amount of work required
Note:				

NB 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.

	Ministry of Higher Education and Scientific Research - Iraq University of Tikrit College of Engineering-Shirqat Departments of Engineering collage	

MODULE DESCRIPTOR

وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**MATLAB PROGRAMMING**			**Module Delivery**	
Module Type	**CORE**			☒ Theory ☐ Lecture ☒ Lab ☐ Tutorial ☐ Practical ☐ Seminar	
Module Code	**TUSHEE1205**				
ECTS Credits	٤				
SWL (hr/sem)	١٠٠				
Module Level	**1**		**Semester (s) offered**		**1**
Administering Department	**Electrical**		**College**	**Engineering- Shirqat**	
Module Leader	**Mohammed Nejres Ahmed**		**e-mail**	mohammed.nejres.ahmed@tu.edu.iq	
Module Leader's Acad. Title	**Asst Lecturer**		**Module Leader's Qualification**		**MSc**
Module Tutor	**Mohammed Ahmed Hassan**		**e-mail**	moh_ahmed@tu.edu.iq	
Peer Reviewer Name	**Ayad Atiyah Abdulkafi**		**e-mail**	ayad_atiyah@tu.edu.iq	

Review Committee Approval	**01/06/2023**	**Version Number**	1.0

Relation With Other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None	**Semester**	-
Co-requisites module	None	**Semester**	-
Module Aims, Learning Outcomes, Indicative Contents and Brief Description أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية مع وصف مختصر			
Module Aims أهداف المادة الدراسية	7. The main objective of this course is to provide a foundation in programming for engineering problem solving using the MATLAB software package. Students will develop the skills analyze and break down an engineering program and solve it algorithmically using MATLAB. 8. Understanding the MATLAB environment. 9. Being able to do simple calculations using MATLAB. 10. Being able to carry out numerical computations and analyses using MATLAB		
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	By the end of the module, students should be able to: **LO6.** Understand the main features of the MATLAB development environment. **LO7.** Use the MATLAB GUI effectively. **LO8.** Design simple algorithms to solve problems. **LO9.** Write simple programs in MATLAB to solve scientific and mathematical problems. **LO10.** Know where to find help. **LO11.** Understanding of the matrices and arrays manipulation in MATLAB. **LO12.** Have knowledge of data type in MATLAB. **LO13.** Have knowledge of basic MATLAB Functions. **LO14.** Make the student able to design, code, and test small MATLAB programs. **LO15.** Understanding how to handle the strings, data type conversion and bitwise operations in MATLAB. **LO16.** Have knowledge of basic MATLAB Simulink. **LO17.** Have Practical skills to solving electrical related problems by MATLAB		
Indicative Contents المحتويات الإرشادية	Indicative contents include the following. **MATLAB Programming (30 Hours)**		

	1. Introduction to MATLAB, Command Window and Basic Arithmetic. (2 Hrs) 2. Vectors , Matrices , Matrix Arithmetic . (2 Hrs) 3. Plotting and Graphics:2D plotting commands , plot, subplot , 3D plots , Graphics of functions of two variables. (3 Hrs) 4. Solving algebraic equations: Solving equations , plotting symbolic equations , system of equations. (3 Hrs) 5. M-files and operators: M-files , structuring script m-files , relational operators, logical operators . (2 Hrs) 6. Flow Control: if Conditions , for loop, while loop , break. (5 Hrs) 7. Basic symbolic calculus: Calculating limits, computing derivatives, solving differential equations, Integration, Laplace transforms. (3 Hrs) 8. Functions; M-file Functions, calling functions, defining functions. (3 Hrs) 9. 3D matrix and images: 3D matrix , display images , read images. (3 Hrs) 10. Simulink: Introduction to MATLAB Simulink , Simulink libraries , Building Models , Simulation Parameters. (4 Hrs)
Course Description	The course provides a gentle introduction to the MATLAB computing environment, and is intended for beginning users and those looking for a review. It is designed to give students a basic understanding of MATLAB, including popular toolboxes. The course consists of interactive lectures and sample MATLAB problems given as assignments and discussed in class. No prior programming experience or knowledge of MATLAB is assumed. Concepts covered include basic use, graphical representations and tips for designing and implementing MATLAB code.
Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The teaching of the course is delivered through a combination of lectures, exercises, and laboratory work.

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	63	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4.2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	37	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	2.4

Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	100

Module Evaluation

تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	4	20 % (20)	3, 6, 9, 12	All LO
	Assignments	4	5% (5)	Continuous	All LO
	Lab.	12	10% (10)	Continuous	All LO
	Lab Report	12	5% (5)	Continuous	All LO
Summative assessment	Midterm Exam	2 hr	10% (10)	7	LO # 1-5
	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 MATLAB, Command Window and Basic Arithmetic.
Week 2	Vectors, Matrices, Matrix Arithmetic .
Week 3	Plotting and Graphics:2D plotting commands, plot, subplot, 3D plots, Graphics of functions of two variables.

Week 4	Solving algebraic equations: Solving equations
Week 5	Plotting symbolic equations , system of equations.
Week 6	M-files and operators: M-files , structuring script m-files , relational operators, logical operators .
Week 7	Flow Control: if Conditions , for loop, while loop , break.
Week 8	Midterm Exam
Week 9	Basic symbolic calculus: Calculating limits, computing derivatives, solving differential equations, Integration, Laplace transforms.
Week 10	Basic symbolic calculus: Calculating limits, computing derivatives, solving differential equations, Integration, Laplace transforms.
Week 11	Functions; M-file Functions, calling functions, defining functions
Week 12	3D matrix and images: 3D matrix, display images , read images.
Week 13	Simulink: Introduction to MATLAB Simulink, Simulink libraries
Week 14	Simulink: Building Models , Simulation Parameters
Week 15	Preparing for Final Exam
Week 16	**Final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Introduction to MATLAB.
Week 2	Basic operation in MATLAB using Matrix and array input type.
Week 3	Plotting simple graphs.
Week 4	Solving equations
Week 5	Plotting symbolic equations , system of equations.

Week 6	M-files and operators: M-files , structuring script m-files.
Week 7	Flow Control: if Conditions , for loop, while loop , break.
Week 8	Computing derivatives, solving differential equations,
Week 9	Integration, Laplace transforms.
Week 10	Calling functions, defining functions
Week 11	3D matrix and images: 3D matrix, display images , read images.
Week 12	Introduction to MATLAB Simulink, Simulink libraries
Week 13	Simulink: Building Models , Simulation Parameters
Week 14	Building Simple Simulink Model
Week 15	Preparing for final exam

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Stormy Attaway, 2012, "MATLABA Practical Introduction to Programming and Problem Solving", 2nded, Elsevier Inc., New York, USA, ISBN 978-0-12-385081-2.	No
Recommended Texts	1- The primary text is Essentials of MATLAB Programming, second edition, by Stephen J. Chapman, published by CENGAGE Learning, 2009. 2- R.K.Bansal, A.K.Goel, M.K.Sharma, MATLAB and its Applications in Engineering , 2009, Pearson Education	No
Websites	https://www.mathworks.com/products/matlab/programming-with-matlab.html	

APPENDIX:

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	مقبول بقرار	(45-49)	More work required but credit awarded
	F - Fail	راسب	(0-44)	Considerable amount of work required
Note:				

NB 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.

	Ministry of Higher Education and Scientific Research - Iraq University of Tikrit College of Engineering-Shirqat Department of Electrical Engineering	

MODULE DESCRIPTOR

وصف المادة الدراسية

Module Information معلومات المادة الدراسية				
Module Title	**Democracy and Human Rights**		**Module Delivery**	
Module Type	**BASIC**		**Theory**	
Module Code	**UOT004**			
ECTS Credits	**2**			
SWL (hr/sem)	**50**			
Module Level	2		**Semester (s) offered**	4
Administering Department	Electrical Engineering		**College**	Al Shirqat Engineering
Module Leader	Ali H. hadees		**e-mail**	ali.h.hadees@tu.edu.iq
Module Leader's Acad. Title	Lecturer		**Module Leader's Qualification**	MA
Module Tutor	Ali H. hadees		**e-mail**	ali.h.hadees@tu.edu.iq
Peer Reviewer Name	Ali H. hadees		**e-mail**	ali.h.hadees@tu.edu.iq
Review Committee Approval	01/06/2023		**Version Number**	1.0

Relation With Other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module		**Semester**	
Co-requisites module		**Semester**	-
Module Aims, Learning Outcomes, Indicative Contents and Brief Description أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية مع وصف مختصر			
Module Aims أهداف المادة الدراسية	٩- المام الطالب بثقافة الديمقراطية ومعرفتها العلمية ومفاهيمها. ١٠-تعريف الطالب الربط بين حقوق الانسان وثقافة الديمقراطية. ١١-تعريف الطالب انواع الانظمة السياسية وتطورها وتأثرها بمفاهيم الديمقراطية. ١٢-تعريف الطالب باساليب ممارسة وتنظيم الحقوق السياسية (الانتخابات). ١٣-القدرة على ادراك المفهوم الاساسي لحقوق الانسان والطفل والديمقراطية. ١٤-القدرة على فهم الاصول التاريخية للمفهومين. ومعرفة ايجابيات وسلبيات حقوق الانسان والديمقراطية. ١٥-الاطلاع على حقوق الانسان والطفل والديمقراطية في الاسلام. ١٦-التعرف على مصادر حقوق الانسان والطفل وخصائص وسمات الديمقراطية. ١٧-معرفة اثر التطور التكنولوجي على حقوق الانسان والطفل والديمقراطية. ١٨-التطرق لمفاهيم ذات صلة بالمصطلحين مثل (العولمة، مؤسسات المجتمع المدني ، الانتخابات والاستفتاء ، الحكم الرشيد ، الجرائم الانسانية، الدستور). ١٩-الاطلاع على الضمانات التي تكفل حقوق الانسان والطفل وتكفل النظام الديمقراطي والحقوق والحريات العامة.		
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	عند اكمال المقرر فان الطلبة قادرين على : ١. التعرف على مفهوم الديمقراطية وجذورها وتطورها. ٢. التعرف على اشكال الديمقراطية. ٣. .تطبيق مفهوم الديموقراطية في المجتمع . ٤. .الاعتماد علي احدث الطرق الحديثة للديمق ا رطية. ٥. .متابعة كافة التقارير والبحوث الحديثة في مجال الديمقراطية ٦. الربط بين ثقافة الديمقراطية وحقوق الانسان. ٧. معرفة آليات الممارسة الديمقراطية من خلال نظم الانتخابات. ٨. التعرف بانواع واشكال الديمقراطية ومميزات كل نظام. ٩. -1التعرف على المصطلحات ذات الصلة بمفهوم حقوق الانسان والطفل والديمقراطية. ١٠. التعرف على اهم الحقوق التي كفلها الإسلام للإنسان والطفل واستثمارها في معالجة الآفات والحالات السلبية التي تغزو المجتمعات في العصر الحالي. ١١. الاستفادة من مزايا الديمقراطية ومكوناتها في معالجة التذبذب وعدم الاستقرار في المجتمع والحفاظ على الاستقرار والسلم المجتمعي . ١٢. الاطلاع على المواثيق الدولية المختصة بمجالات حقوق الانسان والطفل الصادرة عن المنظمات الدولية وجمعية الأمم المتحدة. ١٣. الاستفادة من تجارب الاخرين (الدول المتقدمة في مجالات حقوق الانسان والطفل		

	والديمقراطية). ١٤. الألمام بالقوانين والدساتير الدولية والإقليمية والمحلية المختصة بقضايا حقوق الانسان والحريات العامة والديمقراطية. ١٥. التعرف على جرائم الإبادة الجماعية والجرائم الإنسانية ومدى تأثيرها على مفهوم حقوق الانسان والطفل والديمقراطية.
Indicative Contents المحتويات الإرشادية	١. التعرف على مفهوم الديمقراطية و تاثر الديموقراطية بالمفاهيم في كل مجتمع ٢. التعرف على نشأة مصطلح الديمقراطية وتطوره وابعاده و توضيح اشكال الديمقراطية والاختلاف بين مميزات كل شكل ٣. التعرف على الشكل الاولي للديمقراطية من خلال ممارستها بصورة مباشرة و توضيح تطور الديمقراطية الى الشكل الثاني منها (الديمقراطية شبه المباشرة) ٤. توضيح معنى الديمقراطية التمثيلية ونشأتها وتطورها و التعريف باركان النظام التمثيلي واشكاله والفروق بينها ومميزات كل شكل ٥. التعريف بالمجلس النيابي ونظام المجلس الواحد والمجلسين ومبررات وجود المجلسين و التعريف بآلية الانتخابات و التكييف القانوني للانتخاب ٦. توضيح معنى هيئة الناخبين وتكوينها وتعريف الطلاب بكيفية تحديد الدوائر الانتخابية والقوائم الانتخابية ٧. امتحانات نصف الفصل ٨. حقوق الانسان والطفل والديمقراطية في الحضارات القديمة والإسلام . ٩. مصادر حقوق الانسان العالمية والمحلية، خصائص وسمات الديمقراطية ١٠. ضمانات حقوق الانسان العالمية والمحلية وضمانات النظام الديمقراطي ١١. حقوق الانسان والطفل والديمقراطية واثر التقدم التكنولوجي عليهما ١٢. العولمة ، مؤسسات المجتمع المدني ، الانتخابات والاستفتاء، الدستور ١٣. الجرائم الإنسانية وانواعها ، الحكم الرشيد ١٤. الوثائق الدولية الخاصة بحقوق الطفل والديمقراطية المعاصرة ١٥. مراجعة عامة
Course Description	يوفر المقرر معلومات عامة عن تطوير وفهم مبادئ حقوق والانسان والديموقراطية وتطبيقها في الجانب التعليمي لما له اهمية بالنهوض بتقدم البلد.
Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	5- المحاضرات النظرية 6- الامتحانات الشهرية 7- الواجبات البيتية

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	33	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	2.2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	17	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	1.2
Total SWL (h/sem)	50		

الحمل الدراسي الكلي للطالب خلال الفصل	

Module Evaluation
تقييم المادة الدراسية

		Time (hr)	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	4	30% (30)	All	LO #1-, 3
	Assignments	4	10% (10)	All	LO # 1, 2, 3, 4, and 5
Summative assessment	**Midterm Exam**	2	10% (10)	7	LO # 1-3
	Final Exam	3	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
Week 1	التعرف على مفهوم الديمقراطية
Week 2	تاثر الديموقراطية بالمفاهيم في كل مجتمع
Week 3	التعرف على نشأة مصطلح الديمقراطية وتطوره وابعاده
Week 4	توضيح اشكال الديمقراطية والاختلاف بين مميزات كل شكل
Week 5	التعرف على الشكل الاولي للديمقراطية من خلال ممارستها بصورة مباشرة
Week 6	توضيح تطور الديمقراطية الى الشكل الثاني منها (الديمقراطية شبه المباشرة)
Week 7	توضيح معنى الديمقراطية التمثيلية ونشأتها وتطورها
Week 8	حقوق الانسان والطفل والديمقراطية في الحضارات القديمة والإسلام .

Week 9	مصادر حقوق الانسان العالمية والمحلية، خصائص وسمات الديمقراطية
Week 10	ضمانات حقوق الانسان العالمية والمحلية وضمانات النظام الديمقراطي
Week 11	حقوق الانسان والطفل والديمقراطية واثر التقدم التكنولوجي عليهما
Week 12	العولمة ، مؤسسات المجتمع المدني ، الانتخابات والاستفتاء، الدستور
Week 13	الجرائم الإنسانية وانواعها ، الحكم الرشيد
Week 14	الوثائق الدولية الخاصة بحقوق الطفل والديمقراطية المعاصرة
Week 15	مراجعة عامة
Week 16	**Final Exam**

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	حقوق الانسان والطفل والديمقراطية , د ماهر صالح علاوي وأخرون ٢٠٠٩.	نعم
Recommended Texts	١- باسل يوسف , دبلوماسية حقوق الانسان المرجعية القانونية والاليات ,بيت الحكمة ,بغداد ٢٠٠٢ ٢- د رياض عزيز هادي , حقوق الانسان تطورها مضامينها حمايتها , بغداد ٢٠٠٥. د محمد عابد الجابري , الديمقراطية وحقوق الانسان , مركز دراسات الوحدة العربية بيروت ١٩٩٤.	كلا
Websites		

APPENDIX:

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	مقبول بقرار	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required
Note:				

NB 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.

	Ministry of Higher Education and Scientific Research - Iraq University of Tikrit College of Engineering-Shirqat Departments of Engineering collage	

MODULE DESCRIPTOR

وصف المادة الدراسية

Module Information معلومات المادة الدراسية				
Module Title	**ELECTRICAL POWER SYSTEM**		**Module Delivery**	
Module Type	**CORE**		☒ Theory ☒ Lecture ☐Lab ☒ Tutorial ☐ Practical ☒ Seminar	
Module Code	**TUSHEE3100**			
ECTS Credits	**6**			
SWL (hr/sem)	**150**			
Module Level	**3**	**Semester (s) offered**		**5**
Administering Department	**Electrical**	**College**	**Engineering- Shirqat**	

Module Leader	**Ghanim Thiab Hasan**	**e-mail**	ghanim_hassan@tu.edu.iq
Module Leader's Acad. Title	**Assistant Professor**	**Module Leader's Qualification**	**Msc.**
Module Tutor	**Kamil Jadu Ali**	**e-mail**	kmil.ali78@tu.edu.iq
Peer Reviewer Name	**Asst Prof Dr. Khamees Kh. Hasan**	**e-mail**	kaljomaily@tu.edu.iq
Review Committee Approval	01/06/2023	**Version Number**	1.0

Relation With Other Modules

العلاقة مع المواد الدراسية الأخرى

Prerequisite module	TUSHEE1200	**Semester**	2
Co-requisites module	None	**Semester**	-

Module Aims, Learning Outcomes, Indicative Contents and Brief Description

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية مع وصف مختصر

Module Aims أهداف المادة الدراسية	1. Understand the Structure of power system and its elements techniques. 2. Introduction to types of power stations, steam, hydro, gas turbines, nuclear power, M.M.O. generation, related topics on energy conversion. AC or DC. techniques. 3. Study and understand Single and 3-phase transmission, development of electric power in Iraq. 4. Understand and analyze the concepts of economic aspects of power system planning. 5. Cost evaluation of power system projects, selection of generation units. 6. power factor improvement, tariffs, choice of economic transmission voltage. 7. Mechanical design of a transmission line, calculation of sag, number of towers and insulators, design of suspension insulators, voltage distribution and efficiency of string insulators. 8. Transmission line parameters , line resistance, line inductance, single-phase line with multi conductors, bundling. 9. line inductance of three-phase transmission system, single phase and three-phase capacitance. 10. Electrical characteristics of an overhead transmission lines: Short, medium and long transmission lines.
Module Learning Outcomes	On successful completion of the course students will be able to:

مخرجات التعلم للمادة الدراسية	**LO1.** Explain the principles of electrical power System and Identify its basic elements. **LO2.** Analyze the principles of electric power generation. **LO3.** Analyze the principles of electric power transmission. **LO4.** Understanding the principles of 3-phase transmission lines. **LO5.** Understanding the concept of power factor improvement. **LO6.** Understanding the concept of tariffs, choice of economic transmission voltage. **LO7.** Understanding the mechanical design of a transmission line, calculation of sag, number of towers and insulators, design of suspension insulators, voltage distribution and efficiency of string insulators. **LO8.** Understanding the transmission line parameters , line resistance, line inductance, single-phase line with multi conductors, bundling. **LO9.** Understanding and Analyze the line inductance of three-phase transmission system, single phase and three-phase capacitance. **LO10.** Understand and analysis the electrical characteristics of an overhead transmission lines: Short, medium and long transmission lines.
Indicative Contents المحتويات الإرشادية	Indicative contents include the following. **Part A: Electrical power system parameters (41 Hours)** 1. Introduction to the Structure of power system and its elements techniques. (12 hours). 2. Introduction to types of power stations, steam, hydro, gas turbines, nuclear power. (4 hours). 3. Generation, related topics on energy conversion. AC or DC. techniques.(12 hours). 4. Basic Principles of Single and 3-phase transmission, development of electric power in Iraq.(5 hours). 5. Transmission line parameters , line resistance, line inductance, single-phase line with multi conductors, bundling. (8 hours). **Part B: Economical aspects of power system planning: (34 Hours)** 1. Understand and analyze the concepts of economic aspects of power system planning.(8 hours). 2. Cost evaluation of power system projects, selection of generation units. (4 hours). 3. power factor improvement, tariffs, choice of economic transmission voltage. (12 hours). 4. Transmission line parameters. (12 hours), 5. Electrical characteristics of an overhead transmission lines: Short, medium and long transmission lines. (5 hours).
Course Description	This course aims to enable students to be familiar with fundamental concepts and issues, to develop good understanding the principles of power system techniques, to perform simple analysis and assessment of system performance. From a system engineering perspective, we will find that the developments and advances of electrical power technologies are closely related to those of

	electrical engineering and computer engineering. For students who undertake studies in fields other than electrical and power generation,, this course will provide an in-depth overview of the fundamentals as well as modern techniques and systems in the electrical power generation and distribution fields.

Learning and Teaching Strategies

استراتيجيات التعلم والتعليم

Strategies	The teaching of the course is delivered through a combination of lectures, online lectures, tutorials, exercises works.

Student Workload (SWL)

الحمل الدراسي للطالب

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	78	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	5.2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	72	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	4.8
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	150		

Module Evaluation

تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
	Quizzes	6	30 % (30)	3, 6, 9, 12	All LO

Formative assessment	**Assignments**	10	10% (10)	Continuous	All LO
	Lab.				
	Report			Continuous	All LO
Summative assessment	**Midterm Exam**	2 hr	10% (10)	7	LO # 1-5
	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 electrical power system and its Block diagram
Week 2	Introduction to types of power stations, steam, hydro, gas turbines, nuclear power.
Week 3	Generation, related topics on energy conversion. AC or DC. techniques.
Week 4	Basic Principles of Single and 3-phase transmission, development of electric power in Iraq.
Week 5	Transmission line parameters , line resistance
Week 6	, line inductance,
Week 7	single-phase line with multi conductors.
Week 8	.bundling.
Week 9	Understand and analyze the concepts of economic aspects of power system planning.
Week 10	Cost evaluation of power system projects.
Week 11	Selection of generation units
Week 12	Power factor improvement.
Week 13	Choice of economic transmission voltage.
Week 14	Transmission line parameters.

Week 15	Preparing for Final Exam
Week 16	**Final Exam**

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Electric Power Systems, 5th Edition B. M. Weedy, B. J. Cory, N. Jenkins, Janaka B. Ekanayake, Goran Strbac. ISBN: 978-0-470-68268-5 August 2012	No
Recommended Texts	Electrical Power System by C L Wadhwa (6th Edition) Paperback – 24 April 2018.	No
Websites	https://cae.tu.edu.iq/ed/electronic-lectures.html	

APPENDIX:

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	مقبول بقرار	(45-49)	More work required but credit awarded
	F - Fail	راسب	(0-44)	Considerable amount of work required
Note:				

NB 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.

	Ministry of Higher Education and Scientific Research - Iraq University of Tikrit College of Engineering-Shirqat Department of Electrical Engineering	

MODULE DESCRIPTOR

وصف المادة الدراسية

Module Information معلومات المادة الدراسية		
Module Title	**ENGINEERING AND NUMERICAL ANALYSIS**	**Module Delivery**
Module Type	CORE	**Theory** **Tutorial**
Module Code	**TUSHEE3101**	
ECTS Credits	6	
SWL	**150**	

(hr/sem)			
Module Level	3	**Semester (s) offered**	5
Administering Department	Electrical Engineering	**College**	Al Shirqat Engineering
Module Leader	Harith. A. Ali	**e-mail**	dr.harithali@tu.edu.iq
Module Leader's Acad. Title	Lecturer	**Module Leader's Qualification**	PhD
Module Tutor	Harith. A. Ali	**e-mail**	dr.harithali@tu.edu.iq
Peer Reviewer Name	Ayad Atiyah Abdulakfu	**e-mail**	ayad_atiyah@tu.edu.iq
Review Committee Approval	01/06/2023	**Version Number**	1.0

Relation With Other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	TUSHEE2200	**Semester**	4
Co-requisites module	None	**Semester**	-
Module Aims, Learning Outcomes, Indicative Contents and Brief Description أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية مع وصف مختصر			
Module Aims أهداف المادة الدراسية	20- Develop an understanding of different mathematical methods used to model engineering applications 21- Ability to implement and solve mathematical models for engineering problems		
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	On completion of this course students will be able to: 1- Identify, formulate, and solve engineering problems. 2- Use mathematical and analytical tools to solve engineering problems. 3- Communicate effectively about engineering problems. 4- Work effectively in teams on engineering projects. 5- Apply engineering principles to real-world problems.		
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. **Part A Engineering Analysis** • Complex analysis (14hrs) • Gamma and Beta function (7hrs)		

	• Laplace Transform (14hrs) • Fourier Series (14hrs) • Partial Differential Equations (7hrs) **Part B: Numerical Analysis** • Solving Non-linear Equations (14hrs) • Numerical Differentiation (14hrs) • Solving a System of Linear Equations (7hrs) • Numerical Integration (7hrs) • Solving Ordinary Differential Equations (7hrs)
Course Description	Mathematical analysis with emphasis on solution techniques and engineering applications. Topics include ordinary differential equations (ODEs), Laplace transformations, initial and boundary value problems, Fourier series and partial differential equations. Numerical differentiation, numerical integration.
Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	8- Engage students in active learning activities such as group discussions, case studies, and problem-solving exercises. Encourage them to actively participate in class by asking questions, sharing their ideas, and collaborating with their peers. 9- Emphasize conceptual understanding before delving into mathematical derivations. Help students grasp the underlying principles and theories, and then demonstrate how these concepts can be applied mathematically to solve engineering problems. 10- Use a variety of assessment methods to evaluate students' understanding and progress. Incorporate quizzes, assignments, projects, and exams that test their analytical skills, problem-solving abilities, and critical thinking.

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	108	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	7.2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	42	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	2.8
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	150		

Module Evaluation تقييم المادة الدراسية					
		Time (hr)	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	4	30% (30)	All	LO #1-, 3
	Assignments	4	10% (10)	All	LO # 1, 2, 3, 4, and 5
Summative assessment	**Midterm Exam**	2	10% (10)	7	LO # 1-3
	Final Exam	3	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Complex analysis (complex function, limit, continuity)
Week 2	Complex analysis (Derivative of complex, and complex integral)
Week 3	Gamma and Beta function
Week 4	Laplace Transform: - The General Method - The Transform of Special Functions
Week 5	Laplace Transform: - The Shifting Theorems - The Differentiation and Integration of Transforms - Solving Differential Equations by Laplace Transform
Week 6	Fourier Series - The Euler Formulas - Half Range Expansion
Week 7	Fourier Transform - Properties of Fourier Transform - Solving Differential Equations by Fourier Transform
Week 8	Partial Differential Equations -Separation of Variables (Heat and Wave Equations)
Week 9	Solving Non-linear Equations (Bisection method, False-Position Method).

Week 10	Solving Non-linear Equations (Newton-Raphson Method, Secant Method).
Week 11	Numerical Differentiation (Finite difference method for solving differential equations).
Week 12	Numerical Differentiation (Finite difference method for solving differential equations).
Week 13	Solving a System of Linear Equations (Gauss-elimination method, Gauss Jordan elimination method and iterative methods (Jacob's method and Gauss-Seidel)).
Week 14	Numerical Integration(trapezoidalmethod,1/3Simpson'sruleand3/8Simpson'srule).
Week 15	Solving Ordinary Differential Equations (Euler's Methods, Runge-Kutta methods).
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	Advanced engineering mathematics Erwin Kreyszig in Collaboration with Herbert Kreyszig and Edward J. Norminton	Yes
Recommended Texts	Advanced Engineering Mathematics, 5th ed., D.G. Zill and M.R. Cullen.	Yes

	Advanced Engineering Analysis, 10th ed., Erwin K.	
Websites		

APPENDIX:

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	مقبول بقرار	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required
Note:				

NB 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.

	Ministry of Higher Education and Scientific Research - Iraq University of Tikrit College of Engineering-Shirqat Departments of Engineering collage	

MODULE DESCRIPTOR

وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**COMMUNICATION SYSTEMS**			**Module Delivery**	
Module Type	**CORE**			☒ Theory ☐ Lecture ☒ Lab ☒ Tutorial ☐ Practical ☐ Seminar	
Module Code	**TUSHEE3102**				
ECTS Credits	**8**				
SWL (hr/sem)	**200**				
Module Level	**3**	**Semester (s) offered**		**5**	
Administering Department	**Electrical**	**College**	**Engineering- Shirqat**		
Module Leader	**Ayad Atiyah Abdulkafi**	**e-mail**	ayad_atiyah@tu.edu.iq		
Module Leader's Acad. Title	**Assistant Professor**	**Module Leader's Qualification**		**PhD**	
Module Tutor	**Ayad Atiyah Abdulkafi**	**e-mail**	ayad_atiyah@tu.edu.iq		
Peer Reviewer Name	**Prof Dr. Khamees Kh. Hasan**	**e-mail**	kaljomaily@tu.edu.iq		
Review Committee Approval	01/06/2023	**Version Number**	1.0		

Relation With Other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None	**Semester**	-
Co-requisites module	None	**Semester**	-

Module Aims, Learning Outcomes, Indicative Contents and Brief Description أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية مع وصف مختصر	
Module Aims	1. Understand analog and digital communication techniques.

أهداف المادة الدراسية	2. Learn data and pulse communication techniques. 3. Understand and analyze concepts of Analog Modulation schemes, AM, FM. PM, Low pass sampling and Quantization as a random process. 4. Understand and analyze concepts digitization of signals via sampling, quantizing, and encoding. 5. Evolve the concept of SNR in the presence of channel induced noise and study Demodulation of analog modulated signals. 6. Evolve the concept of quantization noise for sampled and encoded signals and study the concepts of reconstruction from these samples at a receiver. 7. To understand the concepts of Digital Modulation Technique, Baseband transmission and Optimum Receiver.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	On successful completion of the course students will be able to: **LO5.** Explain the principles of a communication Systems and Identify its basic elements. **LO6.** Analyze baseband signals in time domain and in frequency domain. **LO7.** Analyze and compute performance of AM modulation in the presence of noise at the receiver. **LO8.** Analyze and compute performance of FM and PM modulation in the presence of noise at the receiver. **LO9.** Understanding the effect of Noise on Communication Systems. **LO10.** Applications of Sampling Theorem and quantization. **LO11.** Understanding and Analyze Analog Pulse Modulation **LO12.** Understanding and Analyze Pulse Code and delta Modulations. **LO13.** Understanding and Analyze Digital formats and line coding. **LO14.** Design and analyze Digital Modulation Techniques **LO15.** Understanding the purpose of multiplexing techniques.
Indicative Contents المحتويات الإرشادية	Indicative contents include the following. **Part A: Analog Communication (30 Hours)** 1. Introduction to Communication systems and its Block diagram, Review of Signal and Systems, Review of Fourier transform and its properties. (8 hours) 2. Fundamental Concepts: Mode of Communication, SNR, Bandwidth, Rate of Communication, Frequency and Wavelength. Baseband and Carrier Communication, Modulation, Continuous Wave (CW) Modulation (4hours) 3. Basic Principles of Amplitude Modulation and Demodulation (8 hours) 4. Angle Modulation. Frequency Modulation (FM) and Phase Modulation (PM) (8 hours) 5. Noise in Communication System (2 hours) **Part B: Digital Communication (30 hours)** 6. Sampling Theorem and quantization (4 hours) 7. Analog Pulse Modulation (APM), Pulse Amplitude (PAM), Pulse Width (PWM), Pulse Position (PPM), Digital Pulse Modulation (DPM) (6 hours) 8. Pulse Code Modulation (PCM) and Delta Modulation (DM) (4 hours) 9. Digital formats and line coding. (4 Hours)

	10. Digital Modulation Techniques: ASK. PSK and FSK (8 hours) 11. Multiplexing Techniques, Frequency Division Multiplexing (FDM) and Time Division Multiplexing (TDM). (4 hours)
Course Description	This course aims to enable students to be familiar with fundamental concepts and issues, to develop good understanding of basic analogue and digital communication techniques, to perform simple analysis and assessment of system performance. From a system engineering perspective, we will find that the developments and advances of telecommunication technologies are closely related to those of electrical engineering and computer engineering. For students who undertake studies in fields other than electrical and telecommunications, this course will provide an in-depth overview of the fundamentals as well as modern techniques and systems in the telecommunication field.
Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The teaching of the course is delivered through a combination of lectures, online lectures, tutorials, exercises, and laboratory work.

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	123	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	8.2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	77	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	5.1
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	٤	٢٠% (٢٠)	٣, 6, 9, 12	LO# 1-9
	Assignments	٤	٥% (٥)	Continuous	All LO
	Lab.	١٢	10% (10)	Continuous	All LO
	Report	١٢	٥% (٥)	Continuous	All LO
Summative assessment	Midterm Exam	2 hr	10% (10)	7	LO # 1-5
	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 Communication systems and its Block diagram
Week 2	Review of Signal and Systems, Review of Fourier transform and its properties.
Week 3	Fundamental Concepts: Mode of Communication, SNR, Bandwidth, Rate of Communication, Frequency and Wavelength. Baseband and Carrier Communication, Modulation, Continuous Wave (CW) Modulation
Week 4	Basic Principles of Amplitude Modulation, AM DSB-SC Modulation, AM Demodulation: synchronous or coherent detection, AM-Double-sideband large (Full) Carrier (AM-DSBFC),
Week 5	AM Frequency Spectrum and Bandwidth and Sideband and Carrier Power, AM-Single-sideband (AM-SSB- Generation and Demodulation of SSB-SC Signals.
Week 6	Angle Modulation. Frequency Modulation (FM)
Week 7	Angle Modulation. Phase Modulation (PM)
Week 8	Noise in Communication System, Sampling Theorem and quantization

Week 9	Sampling Theorem and quantization Continue ....
Week 10	Analog Pulse Modulation (APM), Pulse Amplitude (PAM), Pulse Width (PWM), Pulse Position (PPM), Digital Pulse Modulation (DPM)
Week 11	Pulse Code Modulation (PCM) and Delta Modulation (DM)
Week 12	Digital formats and line coding.
Week 13	Digital formats and line coding. Digital Modulation Techniques: ASK.
Week 14	Digital Modulation Techniques: PSK and FSK
Week 15	Multiplexing Techniques, Frequency Division Multiplexing (FDM) and Time Division Multiplexing (TDM).
Week 16	**Final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Basic Experiments: Adder and Multiplier
Week 2	Part 1- Amplitude Modulation and Demodulation – DSBFC
Week 3	Part 2- Amplitude Modulation and Demodulation - DSBSC
Week 4	Part 2- Amplitude Modulation and Demodulation - SSB
Week 5	Frequency Modulation and demodulation
Week 6	Phase Modulation and demodulation
Week 7	Pulse Amplitude Modulation (PAM) and Demodulation of PAM
Week 8	Time Division Multiplexing (TDM)
Week 9	Pulse Code Modulation (PCM) and PCM Multiplexing
Week 10	Delta Modulation (DM) and Demodulation of DM

Week 11	Digital Modulation Techniques: ASK modulation and Demodulation of ASK
Week 12	Frequency Shift Keying (FSK) and Demodulation of FSK
Week 13	Optical Communication Techniques
Week 14	Frequency Modulation and demodulation
Week 15	Preparing for Final Exam

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	An Introduction to Analog and Digital Communication, Simon Haykins, John Wiley India Pvt. Ltd., 2008, ISBN 978-81-265-3653-5.	Yes
Recommended Texts	Digital and Analog Communication Systems, 8th Edition by L.W. Couch II, Prentice Hall, 2013.	No
Websites	https://cae.tu.edu.iq/ed/electronic-lectures.html	

APPENDIX:

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	مقبول بقرار	(45-49)	More work required but credit awarded
(0 - 49)	**F** - Fail	راسب	(0-44)	Considerable amount of work required
Note:				

NB 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 DESCRIPTOR

وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**TRANSMISSION LINES AND ANTENNA**			**Module Delivery**	
Module Type	**CORE**			☒ Theory ☐ Lecture ☐ Lab ☐ Tutorial ☐ Practical ☐ Seminar	
Module Code	**TUSHEE3103**				
ECTS Credits	**4**				
SWL (hr/sem)	**100**				
Module Level	**3**	**Semester (s) offered**		**5**	
Administering Department	**Electrical**	**College**	**Engineering- Shirqat**		
Module Leader	**Adnan Ali Abdullah**	**e-mail**			
Module Leader's Acad. Title	**Assistant Lecturer**	**Module Leader's Qualification**		**MSc**	
Module Tutor	**Adnan Ali Abdullah**	**e-mail**			
Peer Reviewer Name	**Ayad Atiyah Abdulkafi**	**e-mail**	ayad_atiyah@tu.edu.iq		
Review Committee Approval	01/06/2023	**Version Number**	1.0		

Relation With Other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None	**Semester**	-
Co-requisites module	None	**Semester**	-

Module Aims, Learning Outcomes, Indicative Contents and Brief Description أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية مع وصف مختصر	
Module Aims أهداف المادة الدراسية	1. Understand the concept of transmission lines and their importance, and determine the equivalent circuit of transmission lines, considering resistance, inductance, capacitance, and conductance. 2. Learn the concept of phase velocity and its relationship with the propagation of signals along transmission lines. Analyze the reflection coefficient and understand its impact on signal integrity and power transmission. 3. Investigate standing wave phenomena and identify methods to measure and mitigate wave reflections. 4. Utilize the Smith chart for impedance matching and analysis of transmission line systems. Design and analyze quarter-wave transformers for impedance transformation. 5. Understand the fundamental concepts and principles of antennas and Analyze the properties and characteristics of the Hertz dipole antenna, including its radiation pattern and efficiency. Interpret and analyze field radiation patterns, including their shape, directionality, and beamwidth. Calculate and analyze radiation power density and intensity, and understand their relationship to antenna performance. 6. Differentiate between the near field and far field regions of antennas and understand their respective characteristics and applications. Explain the concept of antenna polarization and its impact on signal propagation and reception. 7. Study and analyze the half-wave dipole and quarter-wave dipole antennas, including their properties, radiation patterns, and impedance characteristics. Understand the principles and applications of phased array antennas, including beamforming and electronic steering. 8. Explore the design and characteristics of helical antennas, including their axial mode and ground plane effects. Study the principles and applications of parabolic antennas, including their focusing properties and high-gain capabilities. Understand the properties and applications of loop antennas, including their resonance, radiation patterns, and compact design.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	**Transmission Lines (TLs)** On successful completion of the course students will be able to: **LO1.** Understand the equivalent circuit of TLs and its components, including resistance, inductance, capacitance, and conductance. Calculate the characteristic impedance of TLs.

	LO2. Explain the concept of phase velocity and analyze and interpret the reflection coefficient **LO3.** Identify and understand standing wave phenomena and employ techniques to measure and mitigate wave reflections. **LO4.** Utilize the Smith chart for impedance matching and analyze transmission line systems. **LO5.** Design and analyze quarter-wave transformers for impedance transformation. Apply stub matching techniques to achieve impedance matching in transmission line systems. **Antennas** On successful completion of the course students will be able to: **LO6.** Understand the fundamental principles and concepts of antennas and their role in wireless communication systems. **LO7.** Analyze the characteristics and properties of the Hertz dipole antenna, including its radiation pattern and efficiency. Interpret and analyze field radiation patterns, understanding their shape, directionality, and beamwidth. Calculate and interpret radiation power density and intensity, and understand their significance in antenna performance. **LO8.** Differentiate between the near field and far field regions of antennas and understand their respective characteristics and applications. Explain the concept of antenna polarization and its impact on signal propagation and reception. **LO9.** Analyze and interpret pattern width, including main lobe width and sidelobe levels, understanding their importance in antenna performance. Study the properties and characteristics of the half-wave dipole and quarter-wave dipole antennas, including their radiation patterns and impedance. **LO10.** Understand the principles and applications of phased array antennas, including beamforming and electronic steering. Explore the design and characteristics of helical antennas, including axial mode and ground plane effects. **LO11.** Learn the principles and applications of parabolic antennas, including focusing properties and high-gain capabilities. Understand the properties and applications of loop antennas, including resonance, radiation patterns, and compact design.
Indicative Contents المحتويات الإرشادية	Indicative contents include the following. **Part A: Transmission Lines (33 Hours)** 1. Introduction to the equivalent circuit of TLs and its components, including resistance, inductance, capacitance, and conductance. Calculate the characteristic impedance of TLs (8 hours)

	2. Fundamental concepts of phase velocity and analyze and interpret the reflection coefficient (5 hours) 3. Principles of the Standing Wave phenomena (4 hours) 4. Smith chart for impedance matching and analyze transmission line systems. (8 hours) 5. Analyze quarter-wave transformers for impedance transformation. Apply stub matching techniques to achieve impedance matching in transmission line systems. (8 hours) **Part B: Antennas (26 hours)** 6. The fundamental principles and concepts of antennas, Hertz dipole antenna (4 hours) 7. Field radiation pattern, radiation power density and intensity (6 hours) 8. Near field-far field, Antenna polarization, Pattern width (6 Hours) 9. Half wave dipole, Quarter wave dipole (6 hours) 10. Phase array antenna, Helical antenna, Parabolic antenna, Loop antenna (6 hours)
Course Description	This course focuses on transmission lines. Students will study key concepts such as equivalent circuit, characteristic impedance, phase velocity, reflection coefficient, standing wave, Smith chart calculation, quarter-wave transformer, and stub matching. By the end of the course, students will have a solid understanding of transmission lines and their importance in electronic communication systems. Students will explore various topics, including antenna introduction, Hertz dipole, radiation patterns, power density, near field-far field, polarization, pattern width, dipole types, phased array, helical, parabolic, and loop antennas. Practical applications and design considerations will be emphasized. By the end of the course, students will have a solid understanding of antennas and the ability to design effective antenna systems for wireless communication.
Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The teaching of the course is delivered through a combination of lectures, online lectures, tutorials, exercises.

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem)	63	**Structured SWL (h/w)**	4.2

الحمل الدراسي المنتظم للطالب خلال الفصل		الحمل الدراسي المنتظم للطالب أسبوعيا	
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	37	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	2.4
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	100		

Module Evaluation

تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	4	20 % (20)	3, 6, 9, 12	All LO
	Assignments	4	5% (5)	Continuous	All LO
	Lab.	0	10% (10)	Continuous	All LO
	Report	12	5% (5)	Continuous	All LO
Summative assessment	Midterm Exam	2 hr	10% (10)	7	LO # 1-5
	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 Transmission lines and their equivalent circuits.
Week 2	Transmission lines components, including resistance, inductance, capacitance, and conductance. Calculate the characteristic impedance of TLs.
Week 3	Fundamental concepts of phase velocity and analyze and interpret the reflection coefficient.
Week 4	Fundamental concepts of phase velocity and analyze and interpret the reflection coefficient. (cont.)
Week 5	Identify and Studying the standing wave phenomena.
Week 6	Smith chart for impedance matching and analyze transmission line systems.
Week 7	Analyze quarter-wave transformers for impedance transformation. Apply stub matching techniques to achieve impedance matching in transmission line systems.
Week 8	The fundamental principles and concepts of antennas, Hertz dipole antenna.
Week 9	Field radiation pattern, radiation power density and intensity.
Week 10	Field radiation pattern, radiation power density and intensity. (cont.)
Week 11	Near field-far field, Antenna polarization, Pattern width.
Week 12	Near field-far field, Antenna polarization, Pattern width. (cont.)
Week 13	Half wave dipole, Quarter wave.
Week 14	Phase array antenna, Helical antenna, Parabolic antenna, Loop antenna.
Week 15	Preparing for Final Exam
Week 16	**Final Exam**

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	**Available in the Library?**
Required Texts		Yes
Recommended Texts		No

Websites	

APPENDIX:

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	مقبول بقرار	(45-49)	More work required but credit awarded
	F - Fail	راسب	(0-44)	Considerable amount of work required
Note:				

	Ministry of Higher Education and Scientific Research - Iraq University of Tikrit College of Engineering-Shirqat Departments of Engineering collage	

MODULE DESCRIPTOR

وصف المادة الدراسية

Module Information
معلومات المادة الدراسية

Module Title	**COMPUTER NETWORKS**	**Module Delivery**	
Module Type	**ELECTIVE**	☒ Theory ☐ Lecture ☐ Lab ☐ Tutorial ☐ Practical ☒ Seminar	
Module Code	**TUSHEE3107**		
ECTS Credits	**6**		
SWL (hr/sem)	**150**		

Module Level	**3**	**Semester (s) offered**	**5**
Administering Department	**Electrical**	**College**	**Engineering- Shirqat**
Module Leader	**Adnan Ali Abdullah**	**e-mail**	adnan.ali23@tu.edu.iq
Module Leader's Acad. Title	**Assistant Professor**	**Module Leader's Qualification**	**MSc**
Module Tutor		**e-mail**	ayad_atiyah@tu.edu.iq
Peer Reviewer Name	**Ayad Atiyah Abdulkafi**	**e-mail**	ayad_atiyah@tu.edu.iq
Review Committee Approval	01/06/2023	**Version Number**	2.0

Relation With Other Modules
العلاقة مع المواد الدراسية الأخرى

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

Module Aims, Learning Outcomes, Indicative Contents and Brief Description
أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية مع وصف مختصر

Module Aims أهداف المادة الدراسية	**Computer Networks Introduction** 1. Gain a foundational understanding of computer networks. 2. Identify the key components and devices used in networks. **OSI and TCP/IP Models and Data Flow**

	3. Understand how data flows in a network using the OSI and TCP/IP models. 4. Explain the functions and protocols associated with each layer. **Physical Layer and Media** 5. Explore the Physical Layer and its role in network communication. 6. Learn about different transmission media and their characteristics. **Data Link Layer** 7. Understand the Data Link Layer and its protocols. 8. Analyze error detection and correction mechanisms in this layer. **Wired LANs: Ethernet** 9. Explore Ethernet as a wired LAN technology. 10. Understand Ethernet frame structure and addressing. **Wireless LANs** 11. Learn about wireless LAN technologies and their features. 12. Understand the challenges and security considerations in wireless networks. **Connecting LANs, Backbone Networks, and VLANs** 13. Explore methods to connect LANs and form larger networks. 14. Understand the concept and benefits of Virtual LANs (VLANs). **Network Layer: Logical Addressing** 15. Gain knowledge of logical addressing and subnetting. 16. Understand different addressing schemes used in networks. **Network Layer: Internet Protocol** 17. Explore the Internet Protocol (IP) and its role in the Network Layer. 18. Learn about IP addressing, subnetting, and routing principles.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	On successful completion of the course students will be able to: **LO1.** Define the concept of computer networks Identify the key components and devices used in computer networks. **LO2.** Understand the OSI and TCP/IP models and their layered architectures. Describe the functions and protocols associated with each layer in the OSI and TCP/IP models. To understand how data flows through a network using the OSI and TCP/IP models. **LO3.** Explain the purpose and characteristics of the Physical Layer in network communication. Identify and compare different types of

	transmission media used in computer networks. Analyze the encoding, signaling, and modulation techniques used in the Physical Layer. **LO4.** Describe the functions and responsibilities of the Data Link Layer in network communication. Identify different data link protocols and their applications in computer networks. Analyze the error detection and correction mechanisms used in the Data Link Layer. **LO5.** Understand the fundamentals of Ethernet as a wired LAN technology. Explain the structure and operation of Ethernet frames. Demonstrate the ability to configure and troubleshoot Ethernet networks. **LO6.** Explain the principles and characteristics of wireless LAN technologies. Identify different types of wireless LAN standards and their applications. Evaluate the security considerations and challenges in wireless LANs. **LO7.** Understand the concepts of connecting LANs to form larger networks. Describe the role of backbone networks in connecting LANs. Explain the concept and benefits of Virtual LANs (VLANs) in network design and management. **LO8.** Describe the purpose and principles of logical addressing in the Network Layer. Demonstrate the ability to perform subnetting and address allocation. Evaluate different addressing schemes used in computer networks. **LO9.** Understand the role of the Network Layer in the Internet Protocol (IP) suite. Explain the functions and mechanisms of IP addressing, subnetting, and routing. Analyze the operation and features of IP-based networks.
Indicative Contents المحتويات الإرشادية	1. Computer Networks Introduction (3 hrs) 2. Physical Layer and Media. (3 hours) 3. Data Link Layer. (3 hours) 4. Wired LANs: Ethernet. (3 hours) 5. Wireless LANs (3 hours) -Seminar (2 hours) 6. Connecting LANs, Backbone Networks, and VLANs. (4 hours) 7. Network Layer: Logical Addressing (3 hours) 8. Network Layer: Internet Protocol (4 hours) -Seminar (2 hours)
Course Description	This comprehensive course on computer networks fundamentals provides an introduction to key concepts, protocols, and technologies. Students will gain a solid understanding of how data flows in a network using the OSI and TCP/IP models. They will explore the layers of these models, associated protocols, and learn to ensure efficient and reliable communication. Topics covered

	include the Physical Layer and Media, Data Link Layer, Wired LANs (Ethernet), Wireless LANs, connecting LANs, backbone networks, and Virtual LANs (VLANs), as well as the Network Layer addressing and Internet Protocol. Through practical exercises and theoretical knowledge, students will develop the skills necessary to design, configure, and troubleshoot computer networks, preparing them for careers in network administration, cybersecurity, and related fields.
Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The teaching of the course is delivered through a combination of lectures, online lectures, homework, seminars and exercises.

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	48	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	3.2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	102	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	6.8
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	150		

Module Evaluation

تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	4	20 % (20)	3, 6, 9, 12	All LO
	Assignments	4	5% (5)	Continuous	All LO
	Sem.	6	10% (10)	Continuous	All LO
	Report	12	5% (5)	Continuous	All LO
Summative assessment	**Midterm Exam**	2 hr	10% (10)	7	LO # 1-5
	Final Exam	3 hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Computer Networks Introduction, OSI and TCP/IP Models and Data Flow.
Week 2	The Physical Layer and its role in network communication.
Week 3	Transmission media and their characteristics. -Understand the Data Link Layer and its protocols.
Week 4	Seminar.
Week 5	Explore Ethernet as a wired LAN technology. -Understand Ethernet frame structure and addressing.
Week 6	Understand Ethernet frame structure and addressing.
Week 7	-Learn about wireless LAN technologies and their features.
Week 8	-Understand the challenges and security considerations in wireless networks.
Week 9	seminar

Week 10	Understand the concept and benefits of Virtual LANs
Week 11	Gain knowledge of logical addressing and subnetting
Week 12	Understand different addressing schemes used in networks.
Week 13	Explore the Internet Protocol (IP) and its role in the Network Layer.
Week 14	Learn about IP addressing, subnetting, and routing principles.
Week 15	Seminar
Week 16	Final Exam

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	TCP IP Protocol Suite -McGraw-Hill Higher Education, by Behrouz A. Forouzan	No
Recommended Texts	Kurose, K. R. (2017). Computer Networking: A Top-Down Approach by James. Kurose, Keith W. Ross.—, 601.	No
Websites	https://www.networkcomputing.com/	

APPENDIX:

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	مقبول بقرار	(45-49)	More work required but credit awarded
(0 - 49)	**F** - Fail	راسب	(0-44)	Considerable amount of work required
Note:				

NB 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.

	Ministry of Higher Education and Scientific Research - Iraq University of Tikrit College of Engineering-Shirqat Departments of Engineering collage	

MODULE DESCRIPTOR

وصف المادة الدراسية

Module Information
معلومات المادة الدراسية

Module Title	**ELECTRICAL MACHINES II (AC)**	**Module Delivery**	
Module Type	**CORE**	☒ Theory ☐ Lecture ☒ Lab ☐ Tutorial ☐ Practical ☐ Seminar	
Module Code	**TUSHEE3200**		
ECTS Credits	**8**		
SWL (hr/sem)	**200**		
Module Level	**3**	**Semester (s) offered**	**6**
Administering Department	**Electrical**	**College**	**Engineering- Shirqat**
Module Leader	**Kamil J. Ali**	**e-mail**	kmil.ali78@tu.edu.iq
Module Leader's Acad. Title	**Assistant Professor**	**Module Leader's Qualification**	**MSc.**
Module Tutor	**Kamil J. Ali**	**e-mail**	kmil.ali78@tu.edu.iq
Peer Reviewer Name	**Kamil J. Ali**	**e-mail**	kmil.ali78@tu.edu.iq
Review Committee Approval	01/06/2023	**Version Number**	1.0

Relation With Other Modules
العلاقة مع المواد الدراسية الأخرى

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

Module Aims, Learning Outcomes, Indicative Contents and Brief Description
أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية مع وصف مختصر

Module Aims أهداف المادة الدراسية	8. Understand principle operation of A.C electrical machines. 9. Learn general rules for A.C. armature winding. 10. Learn construction of A.C. machines. 11. Learn calculation E.M.F. in armature winding. 12. Knowledge three phase induction motor characteristics.

	13. Knowledge three phase induction motor starting. 14. To understand speed control of three phase induction motors. 15. Understand single phase induction motor. 16. Learn principle operation of synchronous machines.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	On successful completion of the course students will be able to understand: **LO16.** Armature winding, E.M.F. in armature, rotating magnetic field calculation synchronous speed in induction motors. **LO17.** Principle operation of three phase induction motor . **LO18.** Characteristics and performance of three phase induction motor. **LO19.** Principle operation of single phase motor. **LO20.** Principle operation of alternators. **LO21.** Analyze sharing load two alternators. **LO22.** Analyze Characteristics and performance of alternators. **LO23.** Analyze voltage regulation of alternator. **LO24.** Principle operation of electrical transformers. **LO25.** Employment of synchronous motor. **LO26.** Making synchronous motor self starting.
Indicative Contents المحتويات الإرشادية	Indicative contents include the following. **Part A: armature winding and induction motors (45 Hours)** 12. Introduction, armature winding , E.M.F in armature, rotating magnetic field, principle operation of induction motors. (16 hours) 13. Construction of A.C. machines.(4hours) 14. Characteristics, starting, braking and speed control of three phase induction motors (20 hours) 15. Principle operation of single phase induction motors (5 hours) **Part B: Synchronous machines. (45 hours)** 16. Construction and winding of alternators (10 hours) 17. Determination of voltage regulation. (10 hours) 18. Parallel operation of alternator.(6 hours) 19. Methods of synchronization.(4 hours) 20. Principle operation of synchronous motors. (10 Hours) 21. Effect of changing field excitation on power factor. (5 hours)
Course Description	The A.C. Machines module provides you with a detailed understanding of how alternators, induction motor and synchronous motors work, from theoretical concepts through to the design of practical alternators and motors. This module will introduce the fundamentals of principle operation of A.C. machines. Specifically, the module elaborates on fundamentals of three phase induction motor, single phase induction motor, synchronous generators and synchronous motor and begins to introduce detail characteristics, performance of each machine and, towards the end of the module highlighting the reasons A.C. machines importance. Students are introduced to current standard

	induction machines as well as the benefits synchronous generator can provide. A laboratory element provides students with hands-on and practical understanding in this field and expands the understanding of its applicability to real-world problems.
Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The teaching of the course is delivered through a combination of lectures, online lectures, tutorials, exercises, and laboratory work.

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	123	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	8.2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	77	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	5.1
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**
	Quizzes	٤	٢٠% (٢٠)	٣, 6, 9, 12	All LO

Formative assessment	**Assignments**	٤	٥% (٥)	Continuous	All LO
	Lab.	١٢	10% (10)	Continuous	All LO
	Report	١٢	٥% (٥)	Continuous	All LO
Summative assessment	**Midterm Exam**	2 hr	10% (10)	7	LO # 1-5
	Final Exam	3 hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	Three phase induction motor ,Construction ,cage and wound rotor types
Week 2	principles of operation ,Equivalent circuit circle diagram
Week 3	torque / speed characteristics .starting torque and maximum torque
Week 4	.speed control, rating and application. testing and efficiency
Week 5	Single phase induction motor ,Construction type of single phase motor
Week 6	equivalent circuit ,torque / speed characteristics
Week 7	different method of starting ,typical application
Week 8	Synchronous machine : Construction ,salient and non salient pole types
Week 9	E.M.F. equation ,windings , chording and distribution factors
Week 10	armature reaction phasor diagram for salient and non salient pole generators, Voltage regulation
Week 11	parallel operation of synchronous generators
Week 12	synchronous motor : Operating ,equivalent circuit.
Week 13	Efficiency and all of transformers **and** all day efficiency of transformers
Week 14	synchronous motor phasor diagram , power factor control

Week 15	torque angle characteristics of synchronous motor , synchronous motor starting
Week 16	**Final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Three phase induction motor no load test
Week 2	Three phase induction motor load test
Week 3	Three phase induction motor starting methods (star-delta).
Week 4	Three phase induction motor speed control by changing poles.
Week 5	Single phase induction motor split phase.
Week 6	Single phase induction motor capacitive phase.
Week 7	The universal motor
Week 8	Measurement of armature resistance in alternator.
Week 9	Three phase synchronous generator open circuit.
Week 10	Three phase synchronous generator short circuit
Week 11	Three phase synchronous generator load test.
Week 12	Three phase synchronous motors no load test.
Week 13	Three phase synchronous motors no load test
Week 14	Operation three phase synchronous motors with difference excitation.
Week 15	Preparing for Final Exam

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	A.C. Machines / Dr.Basil Saied,Dr.Diyaa Ali	Yes
Recommended Texts	Principle of Electrical machines ROHIT MEHTA **3rd Edn. Rev. 2003 ISBN:81-219-0594-X**	No
Websites	https://cae.tu.edu.iq/ed/electronic-lectures.html	

APPENDIX:

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	مقبول بقرار	(45-49)	More work required but credit awarded
	F - Fail	راسب	(0-44)	Considerable amount of work required
Note:				

NB 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.

	Ministry of Higher Education and Scientific Research - Iraq University of Tikrit College of Engineering Department of Electrical Engineering	

MODULE DESCRIPTOR

وصف المادة الدراسية

Module Information
معلومات المادة الدراسية

Module Title	**ELECTRONIC II**	**Module Delivery**	
Module Type	**CORE**	☒ Theory ☒ Lecture ☒ Lab ☒ Tutorial ☐ Practical ☐ Seminar	
Module Code	**TUSHEE3201**		
ECTS Credits	**8**		
SWL (hr./sem.)	**200**		

Module Level	3	**Semester (s) offered**	6
Administering Department	**Electrical Engineering**	**College**	**Engineering- Shirqat**
Module Leader	**Asst Prof Dr. Khamees Kh. Hasan**	**e-mail**	kaljomaily@tu.edu.iq
Module Leader's Acad. Title	**Assistant Professor**	**Module Leader's Qualification**	**PhD**
Module Tutor	**Asst Prof Dr. Khamees Kh. Hasan**	**e-mail**	kaljomaily@tu.edu.iq
Peer Reviewer Name	None	**e-mail**	None
Review Committee Approval	01/06/2023	**Version Number**	1.0

Relation With Other Modules
العلاقة مع المواد الدراسية الأخرى

Prerequisite module	TUSHEE2101	**Semester**	3
Co-requisites module	None	**Semester**	-

Module Aims, Learning Outcomes, Indicative Contents and Brief Description
أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية مع وصف مختصر

Module Aims أهداف المادة الدراسية	In this course, students learn Frequency response of small signal models of BJT, FET, and various amplifier configurations, Frequency response concepts, Transistor at high frequency, Multistage and FET amplifier at low and high frequency, Feedback concepts, types, effects. Feedback topologies. Feedback

	analysis; series, shunt, stability and response of feedback amplifier, Operational amplifier design, characteristics and structure. Difference amplifier (dc and ac analysis). DC level shifting stage, Inverting and non-inverting amplifiers. Integrators, differentiator, adder, subtractor, comparator, precision diode rectifier. Filter concepts, types, and design. Oscillator concepts and design. Power amplifiers types and design. IC biasing design. IC fabrication process.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	**LO1.** Study the frequency response characteristics. **LO2.** Demonstrate knowledge of amplifier frequency response. **LO3.** Interpret and analyze feedback amplifier. **LO4.** Learn designing operational amplifier. **LO5.** Knowledge operational amplifier applications. **LO6.** Study the active filters design. **LO7.** Demonstrate knowledge of oscillator design. **LO8.** Interpret and analyze power amplifiers. **LO9.** Learn designing integrated circuit design. **LO10.** Knowledge integrated circuit fabrication.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. **Part A: Analog Electronics (50 Hours)** • Frequency response characteristics (10 hrs) • Amplifier frequency response (10 hrs) • Feedback Amplifier (10 hrs) • Operational amplifier design (10 hrs) • Operational amplifier applications ((10 hrs). **Part B: Analog Electronics Applications (40 Hours)** • Active filters (8 hrs). • Oscillator (8 hrs). • Power amplifiers (8 hrs). • Integrated circuit design (8 hrs). • Integrated circuit fabrication (8 hrs).
Course Description	This course also aims to establish fundamental knowledge of active filter, Filter concepts, types. Filter approximations, active RC filter design. Ladder design, Oscillator concepts, types. RC and LC oscillator, crystal oscillator. Power amplifiers types. Class A, class B, class AB and push-pull amplifiers. current mirror, current repeater. Wilder current sources. Bipolar technology RTL, DTL, TTL, IC fabrication process, IC components (transistor, capacitor), phase looked loop PLL.
Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The teaching of the course is delivered through a combination of lectures, online lectures, tutorials, exercises, and laboratory work.

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	123	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	8.2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	77	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	5.1
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	200		

Module Evaluation تقييم المادة الدراسية					
		Time (hr.)	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	2	15% (10)	5 ,7, 11, 14	LO # 1,2, 3,4and 5
	Assignments	6	10% (18)	5, 7, 9, 10, 13, 15	LO #1, 2,3,4, and5
	lab	3	15% (12)	Continuous	
Summative assessment	**Midterm Exam**	2	10% (10)	8	LO # 1-5
	Final Exam	3	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Frequency response of small signal models of of BJT's and JFET's.

Week 2	Frequency response concepts, transistor at low and high frequency.
Week 3	Multistage and FET amplifier at low and high frequency. Negative feedback cuncept
Week 4	Feedback analysis; series, shunt, stability and response of feedback amplifier.
Week 5	Operational amplifier design, characteristics and structure. Difference amplifier (dc and ac analysis).
Week 6	IC biasing design, current mirror, Wilder current sources. Inverting and non-inverting amplifiers.
Week 7	Integrators, differentiator. Adder, subtractor. Comparator, Analog computer.
Week 8	Midterm exam
Week 9	Filter concepts, types. Filter approximations.
Week 10	Active RC filter design. Sallen Key Filter
Week 11	Oscillator concepts, types. RC and LC oscillator.
Week 12	Crystal oscillator. 555 Timer, VCO and phase looked loop PLL.
Week 13	Power amplifiers types. Class A. Power amplifiers types. Class B.
Week 14	Power amplifier class AB and push-pull amplifiers. Class C and D. Power amplifiers
Week 15	Bipolar technology RTL, DTL, TTL.
Week 16	**Final Exam**

Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

	Material Covered
Week 1	Lab 1: Amplifier Frequency response
Week 2	Lab 2: Negative Feedback amplifier
Week 3	Lab 3: Operational amplifier Applications
Week 4	Lab 4: Active filter design

Week 5	Lab 5: Oscilators , 555 application
Week 6	Lab 6: PLL and VCO design
Week 7	Lab 7: Final tests

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	**"Electronic Devices and Circuit Theory" by Robert L. Boylestad and Louis Nashelsky, 11th ed. Taylor & Francis, 2013, ISBN-10: 0-13-262226-2, ISBN-13: 978-0-13-262226-4.**	Yes
Recommended Texts	**"INTEGRATED ELECTRONICS" BY JACOB MILLMAN ,CHRISTOS HALKIAS , CHETAN PARIKH, 2ND ED, 2017, ISBN-10: 9780070151420, ISBN-13: 978-0070151420.**	Yes
Websites	https://www.elsys-design.com/en/analog-electronic-engineer/ https://cae.tu.edu.iq/ed/electronic-lectures.html	

APPENDIX:

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	مقبول بقرار	(45-49)	More work required but credit awarded
	F - Fail	راسب	(0-44)	Considerable amount of work required
Note:				

NB 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.

	Ministry of Higher Education and Scientific Research - Iraq University of Tikrit College of Engineering-Shirqat Departments of Engineering collage	

MODULE DESCRIPTOR

وصف المادة الدراسية

Module Information

معلومات المادة الدراسية					
Module Title	**MICROPROCESSOR ENGINEERING**			**Module Delivery**	
Module Type	**CORE**			☒ Theory ☒ Lecture ☒ Lab ☒ Tutorial ☐ Practical ☐ Seminar	
Module Code	**TUSHEE3202**				
ECTS Credits	**8**				
SWL (hr/sem)	**200**				
Module Level	**3**	**Semester (s) offered**		**6**	
Administering Department	**Electrical**	**College**	**Engineering- Shirqat**		
Module Leader	**Adnan Ali Abdullah**	**e-mail**	adnan.ali23@tu.edu.iq		
Module Leader's Acad. Title	**Assistant Lecturer**	**Module Leader's Qualification**		**MSc**	
Module Tutor	**Adnan Ali Abdullah**	**e-mail**	adnan.ali23@tu.edu.iq		
Peer Reviewer Name	Ayad Atiyah Abdulkafi	**e-mail**	ayad_aiyah@tu.edu.iq		
Review Committee Approval	01/06/2023	**Version Number**	1.0		

Relation With Other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None	**Semester**	
Co-requisites module	None	**Semester**	-

Module Aims, Learning Outcomes, Indicative Contents and Brief Description أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية مع وصف مختصر	
Module Aims أهداف المادة الدراسية	1. Provides a broad understanding of microprocessors and computer systems. Covers the main components and functions of a computer system. 2. Focuses on the evolution of Intel microprocessors, with emphasis on the 8086 microprocessor. Explores the internal architecture, registers, physical address generation, and addressing modes specific to the 8086 microprocessor. Introduces the concept of unsigned and signed integer

	numbers. 3. Examines the instruction set of the 8086 microprocessor. 4. Covers data transfer, arithmetic and logic, shift and rotate, flag control, compare, jump, loop, stack, string, subroutines, I/O, and miscellaneous instructions. Discusses the functionalities and usage of each instruction. 5. Aims to teach the conversion of assembly language instructions to machine code. Covers pin-configuration and interface signals for both minimum-mode and maximum-mode configurations. 6. Focuses on understanding the bus cycle and time states in a microprocessor system. Explores memory read and write bus cycles and the input/output interface. 7. Aims to provide knowledge about different types of memory units, including RAM and ROM. Covers memory address decoding and address decoding circuits, with a specific focus on memory interfacing for 16-bit microprocessors.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	On successful completion of the course students will be able to: **LO1.** Understand the main structural components of a computer system. Trace the evolution of Intel microprocessors. Describe the internal architecture and registers of the 8086 microprocessor. Explain the process of physical address generation. **LO2.** Identify and apply the various addressing modes of the 8086 microprocessor. Differentiate between unsigned and signed integer numbers. **LO3.** Demonstrate the ability to perform data transfer instructions. **LO4.** Apply arithmetic and logic instructions for mathematical and logical operations. Utilize shift and rotate instructions to manipulate data bits. Manage flags using flag control instructions **LO5.** Implement subroutines using subroutine instructions. **LO6.** Perform input/output operations using IN/OUT instructions. Apply miscellaneous instructions for various operations and functionalities. **LO7.** Convert assembly language instructions to machine code. Understand pin configurations for microprocessors. Identify and interpret minimum-mode and maximum-mode interface signals. **LO8.** Understand the concept of bus cycle and its time states. Perform memory read and write bus cycles. Interface with input/output devices effectively. **LO9.** Understand the functioning of RAM (Random Access Memory) and ROM (Read Only Memory). **LO10.** Implement memory address decoding. **LO11.** Design and analyze address decoding circuits. Interface 16-bit microprocessors with memory effectively.
Indicative Contents	Indicative contents include the following.

المحتويات الإرشادية	1. Introduction to Main Structural Component of a Computer System, Evolution of Intel Microprocessor, Internal Architecture of 8086µP, Internal Registers of 8086µP. (10 hours) 2. Addressing Modes of 8086µP, Unsigned and Signed Integer Numbers (10 hours) 3. Data Transfer Instructions, Arithmetic and Logic Instructions, Shift and Rotate Instructions, Flag Control Instructions (12 hours) 4. Compare Instructions, Jump Instructions, Loop Instructions, Stack Instructions, Strings Instructions, (10 hours) 5. Subroutines Instructions, Input / Output (IN / OUT) Instructions, Miscellaneous Instructions (8 hours) 6. Converting Assembly Language Instructions to Machine Code, Pin-configuration, Minimum-Mode Interface Signals, Maximum-Mode Interface. (15 hours) 7. Bus Cycle and Time States, Memory Read and write Bus Cycles, Input /Output Interface. (10 hours) 8. RAM (Random Access Memory), ROM (Read Only Memory), Memory Address Decoding, Address Decoding Circuits, 16-bit Microprocessors Memory Interfacing. (15 hours)
Course Description	This course provides a foundation in microprocessors and computer systems. Students will gain an understanding of the main structural components of a computer system, the evolution of Intel microprocessors, and the internal architecture and registers of the 8086 microprocessor. They will learn about physical address generation, addressing modes, and the distinction between unsigned and signed integer numbers. The course also covers the instruction set of the 8086 microprocessor, including data transfer, arithmetic and logic operations, program flow control, stack management, string manipulation, and input/output operations. Students will explore assembly language, converting instructions to machine code, and understanding interface signals. Additionally, they will study system clock and bus cycles, memory units such as RAM and ROM, and effective memory interfacing techniques. By the end of the course, students will have the necessary knowledge and skills to work with microprocessors and computer systems confidently.
Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The teaching of the course is delivered through a combination of lectures, online lectures, tutorials, exercises, and laboratory work.

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	123	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	8.2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	77	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	5.1
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**	4	20 % (20)	3, 6, 9, 12	All LO
	Assignments	4	5% (5)	Continuous	All LO
	Lab.	12	10% (10)	Continuous	All LO
	Report	12	5% (5)	Continuous	All LO
Summative assessment	**Midterm Exam**	2 hr	10% (10)	7	LO # 1-5
	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 Main Structural Component of a Computer System, Evolution of Intel Microprocessor.
Week 2	Internal Architecture of 8086µP, Internal Registers of 8086µP.
Week 3	Addressing Modes of 8086µP.
Week 4	Unsigned and Signed Integer Numbers. Data Transfer Instructions.
Week 5	Arithmetic and Logic Instructions, Shift and Rotate Instructions,
Week 6	Flag Control Instructions. Compare Instructions, Jump Instructions,
Week 7	Loop Instructions, Stack Instructions, Strings Instructions.
Week 8	Subroutines Instructions, Input / Output (IN / OUT) Instructions, Miscellaneous Instructions.
Week 9	Converting Assembly Language Instructions to Machine Code, Pin-configuration, Minimum-Mode Interface Signals, Maximum-Mode Interface.
Week 10	Converting Assembly Language Instructions to Machine Code, Pin-configuration, Minimum-Mode Interface Signals, Maximum-Mode Interface.(cont.)
Week 11	Bus Cycle and Time States, Memory Read and write Bus Cycles, Input /Output Interface.
Week 12	RAM (Random Access Memory), ROM (Read Only Memory),
Week 13	Memory Address Decoding, Address Decoding Circuits, 16-bit Microprocessors Interfacing
Week 14	Memory Address Decoding, Address Decoding Circuits, 16-bit Microprocessors Memory Interfacing. (cont.)
Week 15	Preparing for Final Exam
Week 16	**Final Exam**

Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

	Material Covered
Week 1	Familiarization with the components of a computer system. Hands-on exploration of the internal architecture of 8086 microprocessors. Practical exercises on working with internal registers of 8086 microprocessor.
Week 2	Implementing programs that involve different addressing modes.

Week 3	Practical exercises on working with unsigned and signed integer numbers.
Week 4	Performing data transfer operations using different instructions.
Week 5	Implementing arithmetic and logical operations using appropriate instructions. Understanding the shift and rotate instructions and their applications.
Week 6	Hands-on exercises for manipulating and controlling flags using flag control instructions.
Week 7	Writing programs that utilize loop instructions for repetitive operations.
Week 8	Hands-on exercises on input/output operations using IN/OUT instructions.
Week 9	Studying bus cycles and time states in the microprocessor. Practical exercises.
Week 10	Implementing input/output interfaces and conducting related experiments.
Week 11	Practical experiments involving RAM and ROM operations.
Week 12	Implementing memory interfacing techniques for 16-bit microprocessors.
Week 13	Hands-on exercises on designing and testing address decoding circuits.
Week 14	Can be used for project work or additional laboratory activities related to the previous topics to reinforce the learning outcomes.
Week 15	Final Exam.

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	The 8088 and 8086 Microprocessors: Programming, Interfacing, Software, Hardware, and Applications by Walter A. Triebel	Yes
Recommended Texts	Uffenbeck, John. Microcomputers and microprocessors: the 8080, 8085, and Z-80 programming, interfacing, and troubleshooting. Prentice-Hall, Inc., 1991.	No
Websites	https://micropython.org/	

APPENDIX:

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	مقبول بقرار	(45-49)	More work required but credit awarded
	F - Fail	راسب	(0-44)	Considerable amount of work required
Note:				

NB 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.

	Ministry of Higher Education and Scientific Research - Iraq University of Tikrit College of Engineering-Shirqat Departments of Engineering collage	

MODULE DESCRIPTOR

وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**ELECTRICAL MEASUREMENTS**			**Module Delivery**	
Module Type	**BASIC**			☒ Theory ☐ Lecture ☐ Lab ☐ Tutorial ☐ Practical ☐ Seminar	
Module Code	**TUSHEE3203**				
ECTS Credits	**4**				
SWL (hr/sem)	**100**				
Module Level	**3**	**Semester (s) offered**		**6**	
Administering Department	**Electrical**	**College**		**Engineering- Shirqat**	
Module Leader	**Adnan Ali Abdullah**	**e-mail**		adnan.ali23@tu.edu.iq	
Module Leader's Acad. Title	**Assistant Lecturer**	**Module Leader's Qualification**		**MSc**	
Module Tutor	**Adnan Ali Abdullah**	**e-mail**		adnan.ali23@tu.edu.iq	
Peer Reviewer Name	**Kamil Jadu Ali**	**e-mail**		kmil.ali78@tu.edu.iq	

Review Committee Approval	01/06/2023	**Version Number**	1.0

Relation With Other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None	**Semester**	-
Co-requisites module	None	**Semester**	-

Module Aims, Learning Outcomes, Indicative Contents and Brief Description أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية مع وصف مختصر	
Module Aims أهداف المادة الدراسية	1. **Introduction:** Learn measurement basics and its importance and understand the system of Learn working principles of DC instruments. 2. **AC Measurement:** Gain knowledge of AC instruments for measuring alternating currents and voltages. Understand working principles of H.W. and F.W. rectifier instruments. 3. **Bridge Principles:** Understand principles of bridge measurements. Learn about DC bridges and their applications. Gain knowledge of AC bridges, including inductance, mutual inductance, and capacitance bridges. 4. **Thermocouple Instrument:** Learn about thermocouples and their temperature measurement applications. 5. **Transducers:** Understand role of transducers and sensors in energy conversion. 6. **Digital Measurements:** Learn about digital multimeters (DMMs) and their features.
Module Learning Outcomes	By the end of this course on electrical measurements, students will be able to: **LO 1**

مخرجات التعلم للمادة الدراسية	Demonstrate an understanding of the importance of measurements and the system of units. Apply measurement basics to ensure accurate and reliable results. **LO 2** • Describe the working principles of AC instruments and their applications. • Perform measurements of alternating currents and voltages using AC instruments. • Differentiate between H.W. and F.W. rectifier instruments and understand their uses. **LO 3** • Understand the principles of bridge measurements and their significance in accurate measurements. • Apply knowledge of DC bridges for specific measurement applications. • Gain proficiency in using AC bridges, including inductance, mutual inductance, and capacitance bridges. **LO 4** • Explain the principles of thermocouples and their applications in temperature measurement. • Select and use appropriate thermocouples for specific temperature measurement tasks. **LO 5** • Describe the role of transducers and sensors in converting one form of energy into another. • Classify transducers based on their operating principles. • Apply knowledge of transducers to select and use appropriate sensors for specific measurement needs. **LO 6** • Understand the features and functions of digital multimeters (DMMs). • Use DMMs effectively for accurate digital measurements. • Apply knowledge of DMM features and techniques to obtain reliable measurement results.
Indicative Contents المحتويات الإرشادية	Indicative contents include the following. 1. .Introduction: Measurement, system of units, Measuring errors, classification of errors, analysis of errors, distribution of errors. (6 hours) 2. Fundamental of Measurements: DC-instruments, current instrument, voltage instrument, resistor instrument, series ohmmeter, parallel ohmmeter. (10 hours)

	3. AC measurement: AC-instrument, H.W. rectifier instrument, F.W. rectifier instrument, Electro dynamometer, wattmeter. (10 hours) 4. Bridge principles: Bridges measurements, DC-bridges, classification of bridge circuit, bridges accessories, AC-bridges, inductance bridges, mutual inductance bridges , capacitance bridges. (10 hours) 5. Thermocouples, classification of Transducer, Resistive position Transducer , inductive Transducer , capacitive Transducer and their temperature measurement applications. (10 hours) 6. Transducers and sensors in energy conversion. (4 hours) 7. Digital multimeters (DMMs), A/D converter, Digital voltmeter, single – slope DVM, Dual – slope DNM , DMM and their features. (10 hours)
Course Description	This course covers a wide range of topics related to measurement and instrumentation. Students will begin with an introduction to measurement principles, including the system of units, measuring errors, and the analysis and classification of errors. The fundamentals of DC measurements will be explored, with a focus on DC instruments such as current, voltage, and resistor instruments, as well as series and parallel ohmmeters. AC measurement techniques will be covered, including AC instruments, half-wave and full-wave rectifier instruments, and the electrodynamic wattmeter. Bridge principles will be discussed, including DC and AC bridge circuits, their classification, and accessories. The course also includes in-depth studies on thermocouple instruments, transducers and sensors, and digital measurement techniques using instruments like digital multimeters and A/D converters. Through practical examples and hands-on experience, students will develop the necessary skills to perform accurate measurements in various fields.
Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The teaching of the course is delivered through a combination of lectures, online lectures, tutorials, exercises.

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem)	63	**Structured SWL (h/w)**	4.2

الحمل الدراسي المنتظم للطالب خلال الفصل		الحمل الدراسي المنتظم للطالب أسبوعيا	
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	37	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	2.4
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	100		

Module Evaluation

تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	4	20 % (20)	3, 6, 9, 12	All LO
	Assignments	4	10% (5)	Continuous	All LO
	Lab.	0	10% (10)	Continuous	All LO
	Report	12	10% (5)	Continuous	All LO
Summative assessment	Midterm Exam	2 hr	10% (10)	7	LO # 1-5
	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: Measurement, system of units, Measuring errors,
Week 2	Classification of errors , analysis of errors , distribution of errors.
Week 3	Fundamental of Measurements: DC-instruments, current instrument.
Week 4	Voltage instrument, resistor instrument, Series ohmmeter, parallel ohmmeter
Week 5	AC measurement: AC-instrument, H.W. rectifier instrument, F.W
Week 6	Electro dynamometer , wattmeter
Week 7	Bridge principles: Bridges measurements,
Week 8	DC-bridges, classification of bridge circuit, bridges accessories,
Week 9	AC-bridges, inductance bridges, mutual inductance bridges , capacitance bridges.
Week 10	Thermocouple instrument
Week 11	Transducers : Transducers and sensors , classification of Transducer ,
Week 12	Resistive position Transducer , inductive Transducer , capacitive Transducer.
Week 13	Digital measurements: Digital multimeter, A/D converter, Digital voltmeter
Week 14	Single – slope DVM, Dual – slope DNM , DMM.
Week 15	Preparation for final exam
Week 16	**Final Exam**

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	"Electric circuits" by James W. Nilsson and Riedel, Susan A, tenth edition, 2015.	
Recommended Texts	"FUNDAMENTALS OF ELECTRIC CIRCUITS" by Charles K. Alexander and Matthew N. O. Sadiku, SIXTH EDITION. New York, NY 10121, 2017, ISBN 978-0-07-802822-9	
Websites		

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Fail Group (0 - 49)	**FX** - Fail	مقبول بقرار	(45-49)	More work required but credit awarded
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Note:

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MODULE DESCRIPTOR

وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Electrical Engineering Ethics** **اخلاقيات الهندسة الكهربائية**			**Module Delivery**	
Module Type	**ELECTIVE**			☒ Theory ☐ Lecture ☐ Lab ☐ Tutorial ☐ Practical ☐ Seminar	
Module Code	**TUSHEE320٤**				
ECTS Credits	٢				
SWL (hr/sem)	٥٠				
Module Level	**3**	**Semester (s) offered**		**6**	
Administering Department	**Electrical**	**College**	**Engineering- Shirqat**		
Module Leader		**e-mail**			
Module Leader's Acad. Title		**Module Leader's Qualification**		**MSc.**	
Module Tutor		**e-mail**			
Peer Reviewer Name		**e-mail**			
Review Committee Approval	01/06/2025	**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, Indicative Contents and Brief Description

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية مع وصف مختصر

Module Aims أهداف المادة الدراسية	١٧. تعريف الطلبة بمفهوم أخلاقيات المهنة الهندسية. ١٨. ترسيخ المسؤولية المهنية والقانونية للمهندس الكهربائي. ١٩. تنمية الوعي بأخلاقيات السلامة، الجودة، والبيئة في العمل الهندسي. ٢٠. إعداد مهندس ملتزم بالقيم المهنية والإنسانية في سوق العمل.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	عند إكمال المقرر يكون الطالب قادرًا على: ١. فهم المبادئ الأساسية لأخلاقيات مهنة الهندسة الكهربائية. ٢. التمييز بين السلوك المهني وغير المهني في الممارسة الهندسية. ٣. تطبيق القوانين والأنظمة الأخلاقية في المشاريع الهندسية. ٤. اتخاذ قرارات مهنية مسؤولة تراعي السلامة العامة. ٥. الالتزام بقيم النزاهة، الأمانة، والعمل الجماعي.
Indicative Contents المحتويات الإرشادية	• مقدمة في أخلاقيات المهنة الهندسية • مفهوم المسؤولية المهنية للمهندس • أخلاقيات السلامة والصحة المهنية • القوانين والأنظمة المنظمة لمهنة الهندسة • أخلاقيات التصميم والتنفيذ في الهندسة الكهربائية • أخلاقيات التعامل مع الزملاء وأصحاب العمل • الملكية الفكرية وحقوق النشر الهندسية • أخلاقيات البحث العلمي والهندسي • أخلاقيات البيئة والاستدامة • حالات دراسية في أخلاقيات الهندسة الكهربائية
Course Description	يهدف هذا المقرر إلى تزويد الطلبة بالمعرفة الأساسية حول أخلاقيات مهنة الهندسة الكهربائية، مع التركيز على السلوك المهني، المسؤولية القانونية، السلامة العامة، وحماية البيئة، بما يساهم في إعداد مهندس كهربائي واعٍ وقادر على اتخاذ قرارات مهنية أخلاقية في بيئة العمل.

Learning and Teaching Strategies

استراتيجيات التعلم والتعليم

Strategies	المحاضرات النظرية - مناقشة الحالات الدراسية - الامتحانات الشهرية - الواجبات والتقارير

Student Workload (SWL)

الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	33	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	2.2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	17	**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 (hr)	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	4	30% (30)	All	LO #1-, 3
	Assignments	4	10% (10)	All	LO # 1, 2, 3, 4, and 5
Summative assessment	**Midterm Exam**	2	10% (10)	7	LO # 1-3
	Final Exam	3	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
Week 1	مقدمة في أخلاقيات المهنة
Week 2	المسؤولية المهنية
Week 3	السلامة والصحة المهنية
Week 4	القوانين والأنظمة
Week 5	أخلاقيات التصميم

Week 6	أخلاقيات التنفيذ
Week 7	أخلاقيات العلاقات المهنية
Week 8	امتحان نصف الفصل
Week 9	الملكية الفكرية
Week 10	أخلاقيات البحث
Week 11	أخلاقيات البيئة
Week 12	حالات دراسية
Week 13	حالات دراسية
Week 14	مناقشات تطبيقية
Week 15	مراجعة عامة
Week 16	الامتحان النهائي

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Ethics in Engineering – Mike W. Martin	No
Recommended Texts	Engineering Ethics - Charles E. Harris	No
Websites	https://cae.tu.edu.iq/ed/electronic-lectures.html	

APPENDIX:

GRADING SCHEME

مخطط الدرجات

Group	Grade	التقدير	Marks (%)	Definition
Success Group	**A** - Excellent	امتياز	90 - 100	Outstanding Performance

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

Note:

NB 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.

	Ministry of Higher Education and Scientific Research - Iraq University of Tikrit College of Engineering-Shirqat Departments of Engineering collage	

MODULE DESCRIPTOR

وصف المادة الدراسية

Module Information معلومات المادة الدراسية				
Module Title	**ENGINEERING CONTROL**		**Module Delivery**	
Module Type	**CORE**		☒ Theory ☐ Lecture ☒ Lab ☒ Tutorial ☐ Practical ☐ Seminar	
Module Code	**TUSHEE4100**			
ECTS Credits	**8**			
SWL (hr/sem)	**200**			
Module Level	**4**	**Semester (s) offered**		**7**
Administering Department	**Electrical**	**College**	**Engineering- Shirqat**	
Module Leader	**Ahmed Saad Names**	**e-mail**	ahmed.alnames@tu.edu.iq	
Module Leader's Acad. Title	**Asst Lecturer**	**Module Leader's Qualification**		**MSc**
Module Tutor	**Ahmed Saad Names**	**e-mail**	ahmed.alnames@tu.edu.iq	

Peer Reviewer Name	**Asst Prof Dr. Khamees Kh. Hasan**	**e-mail**	kaljomaily@tu.edu.iq
Review Committee Approval	01/06/2023	**Version Number**	1.0

Relation With Other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	TUSHEE2200	**Semester**	4
Co-requisites module	None	**Semester**	-
Module Aims, Learning Outcomes, Indicative Contents and Brief Description أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية مع وصف مختصر			
Module Aims أهداف المادة الدراسية	1. The core course in electrical engineering introduces the fundamental concepts, principles and application of control system analysis and design to the undergraduate students. 2. The course materials are prepared in such a manner so that it will be very useful not only for students of under graduate program in control systems but also for any level of the students, post-graduate students, teachers and practitioners. 3. This course goes deeper into the various aspects of control engineering. Each topic is developed in logical progression with up-to-date information.		
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	On successful completion of the course students will be able to: **LO1.** Interpret and analyze the control system. **LO2.** Apply the control system engineering algorithm to a range of electrical, mechanical systems designs **LO3.** Identify and formulate problems in electrical engineering and find appropriate solutions in both time domain and frequency domain **LO4.** Specify the most common classical control methods to achieve best design methods such as Nyquist, Bode and Root locus **LO5.** Apply the control system algorithms to design real projects. **LO6.** Interpret and analyze the control system practical consideration. **LO7.** Apply the control system engineering algorithm to design lead /lag compensation **LO8.** Identify and formulate problems in electrical engineering and find appropriate solutions using state space approach **LO9.** Specify the most common applications and design of PID controller		

	LO10. Apply the control system algorithms to analyze nonlinear system. **LO11.** Utilization of engineering software and hardware in problem solving in the control lab.
Indicative Contents المحتويات الإرشادية	Indicative contents include the following. **A. Theory and Tutorial (90 Hours)** 1. Introduction to control systems: (6 hours) 2. Transfer functions of electrical system, mechanical-systems & servo systems (12 hours) 3. Block diagram algebra (6 hours) 4. Time domain response (6 hours) 5. Transient response of second order systems (6 hours) 6. Frequency response (12 hours) 7. Compensation: Lead, lag, lead - lag. (12 hours) 8. Three - term controller (PID) (12 hours) 9. State space analysis: State equation for dynamic system (electrical system), solving state equations. (6 hours) 10. Non- linear control system: describing function approach. (6 hours) 11. Analogue computer. (6 hours) **B. Lab (60 Hours) 4 hours for each week**
Course Description	This course provides an introduction to the fundamental concepts and mathematics of control systems engineering. The topics cover classical control design methods as well as the modern control design techniques. A number of chosen problems are solved to illustrate the concepts clearly. A suite of exercises is also provided in the appendix after each module.
Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The learning and teaching strategy is designed to: Carefully cover in lectures the necessary fundamental material and analytical techniques, and demonstrate concepts with appropriate (and where possible practical) examples Allow students adequate time to practice the techniques using a large number of carefully selected tutorial problems.

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	153	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	10.2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	47	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	3.1
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	200		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	4	20 % (20)	3, 6, 9, 12	All LO
	Assignments	4	5% (5)	Continuous	All LO
	Lab.	15	10% (10)	Continuous	All LO
	Report	15	5% (5)	Continuous	All LO
Summative assessment	**Midterm Exam**	2 hr	10% (10)	7	LO # 1-6
	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 Control Systems.
Week 2	Transfer Function
Week 3	Transfer Function
Week 4	Block Diagram Algebra
Week 5	Time Domain Response
Week 6	Transient Response of Second Order Systems
Week 7	Frequency Response., Nyquist Plot.
Week 8	Frequency Response: Phase Margin, Gain Margin Bode Diagram
Week 9	Compensation: Lead and Lag
Week 10	Compensation: Lead - Lag.
Week 11	Three - Term Controller (PID)
Week 12	Three - Term Controller (PID)
Week 13	State Space Analysis, State Equation for Dynamic System (Electrical System), Solving State Equations.
Week 14	Non-Linear Control System
Week 15	Analogue Computer
Week 16	Final Exam

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Transfer Function of First and Second Order

Week 2	Block Diagram Algebra [Series, Parallel, Closed Loop and Feedback]
Week 3	Transient Response of Second Order System
Week 4	Second-Order Transient Responses
Week 5	Steady- State Error
Week 6	Stability Analysis
Week 7	Root Locus
Week 8	Nyquist And Bode
Week 9	Phase Lag Compensator
Week 10	Phase Lead Compensator
Week 11	PI Controller, Pd Controller
Week 12	PID Controller
Week 13	Non- Linear Control System
Week 14	State Space Analysis
Week 15	Analogue Computer

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Control Systems Theory and Applications, Smarajit Ghosh, 2007 Dorling Kindersley (India) Pvt. Ltd, ISBN 9788131708286, eISBN 9789332506152	Yes
Recommended Texts	Modern Control Engineering Fifth Edition, Katsuhiko Ogata, 2010	Yes
Websites	https://cae.tu.edu.iq/ed/electronic-lectures.html	

APPENDIX:

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	مقبول بقرار	(45-49)	More work required but credit awarded
	F - Fail	راسب	(0-44)	Considerable amount of work required
Note:				

NB 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.

	Ministry of Higher Education and Scientific Research - Iraq University of Tikrit College of Engineering-Shirqat Departments of Engineering collage	

MODULE DESCRIPTOR

وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**POWER ELECTRONICS**			**Module Delivery**	
Module Type	**CORE**			☒ Theory ☐Lecture ☒ Lab ☒ Tutorial ☐ Practical ☐ Seminar	
Module Code	**TUSHEE4101**				
ECTS Credits	**8**				
SWL (hr/sem)	**200**				
Module Level	**4**		**Semester (s) offered**		**7**
Administering Department	**Electrical**		**College**	**Engineering- Shirqat**	
Module Leader	**Ahmed Saad Names**		**e-mail**	ahmed.alnames@tu.edu.iq	
Module Leader's Acad. Title	**Asst Lecturer**		**Module Leader's Qualification**		**MSc**
Module Tutor	**Ahmed Saad Names**		**e-mail**	ahmed.alnames@tu.edu.iq	
Peer Reviewer Name	**Asst Prof Dr. Khamees Kh. Hasan**		**e-mail**	kaljomaily@tu.edu.iq	

Review Committee Approval	01/06/2023	**Version Number**	1.0

Relation With Other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	TUSHEE1200	**Semester**	2
Co-requisites module	None	**Semester**	-
Module Aims, Learning Outcomes, Indicative Contents and Brief Description أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية مع وصف مختصر			
Module Aims أهداف المادة الدراسية	1. To introduce students to the basic theory of power semiconductor devices and passive components, their practical applications in power electronics. 2. To familiarize students to the principle of operation, design and synthesis of AC to Dc conversion circuits and their applications. 3. To familiarize students to the principle of operation, design and synthesis of DC-to-Dc conversion circuits and their applications. 4. Be able to list the types of power semiconductor devices, and know how to choose the suitable device for each application, and calculate the power losses of the power semiconductor. 5. To familiarize students to the principle of operation, design and synthesis of AC-to-AC conversion circuits and their applications. 6. To familiarize students to the principle of operation, design and synthesis of DC to AC conversion circuits and their applications. 7. Recognize the basic operation, losses and efficiency of the power electronics converters. 8. Develop a good insight about the practical issues in power electronics circuit design. 9. Explain the application requirements of converters in given applications.		
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	On successful completion of the course students will be able to: **LO12.** Understand the operation of power electronic devices and its applications. **LO13.** Analyze the I-V characteristics of SCR, DIAC and TRIAC. **LO14.** Analyze the characteristics of MOSFET, IGBT and UJT. **LO15.** Demonstrate the operation of Single phase fully controlled bridge converter with R and RL loads. **LO16.** Understand the characteristics of Step up and Step-down chopper **LO17.** Distinguish the speed control of DC motor using converters		

	LO18. Explain the operation; calculate the performance parameters of each converter such as the average and rms values of the load voltage and current, power and power factor and efficiency. **LO19.** Explain the operation of the single-phase and three-phase AC-to-AC converters and their industrial applications. **LO20.** Explain the operation of the half-bridge and full-bridge single-phase inverters feeding resistive and resistive- inductive loads. Calculate the load voltage and current
Indicative Contents المحتويات الإرشادية	Indicative contents include the following. **A. Theory and Tutorial (90 Hours)** 12. Power Semiconductor Devices (6 hours) 13. Rectifiers (6 hours) 14. Principle of Phase- Controlled Converter Operation (9 hours) 15. Thyristor commutation techniques (6 hours) 16. Principle of Step-Down Step-Up Operation (3 hours) 17. Regulators (3 hours) 18. Thyristor Chopper Circuits(9hours) 19. Chopper Circuit Design (3 hours) 20. AC Voltage Controllers (6 hours) 21. Cycloconverter. (9 hours) 22. Inverters. (30 hours) **B. Lab (60 Hours) 4 hours for each week**
Course Description	The class will consist of lectures, tutorials, and practical sessions. Lectures will introduce new material and provide examples. During the tutorials, students will apply lecture theory to solve related problems. Practical session will be used to familiarize students with laboratory equipment and develop their practical skills
Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The teaching of the course is delivered through a combination of lectures, tutorials, exercises, and laboratory work.

Student Workload (SWL)

الحمل الدراسي للطالب

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	153	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	10.2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	47	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	3.1
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	200		

Module Evaluation

تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	4	20 % (20)	3, 6, 9, 12	All LO
	Assignments	4	5% (5)	Continuous	All LO
	Lab.	15	10% (10)	Continuous	All LO
	Report	15	5% (5)	Continuous	All LO
Summative assessment	Midterm Exam	2 hr	10% (10)	8	LO # 1-6
	Final Exam	3 hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	Applications of Power Electronic, Power Semiconductor Devices, Control Characteristics of Power Devices, Types of Power Electronic Circuits, Design of Power Electronics Equipment, Diodes with RC and RL Load, Diodes with LC and RLC Loads, Free-wheeling Diodes, Recovery of Trapped Energy with a Diode

Week 2	Single-Phase Half-Wave Rectifiers: Performance Parameters, Single-Phase Full-Wave Rectifiers. Multi-phase Star Rectifiers: Three-Phase Bridge Rectifiers, Rectifier Circuit Design,Effects of Source and Load Inductances
Week 3	Principle of Phase- Controlled Converter Operation: Single-Phase Semi converters Single-Phase Full Converters Single-Phase Dual Convener, Single-Phase Series Converter, Three-Phase Half-Wave Converters, Three-Phase Semi converters, Three-Phase Full Converters
Week 4	Three Phase Dual Converters, Power Factor Improvements, Design of Convener Circuits, Effects of Load and Source Inductance. Thyristor commutation techniques: Natural Commutation, Forced Commutation, Self-Commutation, Impulse Commutation, Resonant Pulse Commutation
Week 5	Complementary Commutation, External Pulse Commutation, Load-Side Commutation, Line-Side Commutation, Commutation Circuit Design, Commutation Capacitors, Principle of Step-Down Operation: Step-Down Choppers with RL Load, Principle of Step-Up Operation, Performance Parameters, Switching-Mode Regulators
Week 6	Buck Regulators, Boost Regulators, Buck-Boost Regulators, Cuk Regulators. Limitations of Single-Stage Conversion, Thyristor Chopper Circuits
Week 7	Impulse-Commutated Choppers, Effects of Source and Load Inductance, Impulse-Commutated Three-Thyristor, Resonant Pulse Choppers
Week 8	Chopper Circuit Design. AC Voltage Controllers, Types of AC Voltage Controllers, Methods of Voltage Control, Single-phase AC Voltage Controller Supplying R Loads (Phase Control) , Single-phase AC Voltage Controller Supplying R Loads (Integral Cycle Control), Single-phase Voltage Controller Supplying RL Loads.
Week 9	Three-phase AC Voltage Controller: Cycloconverter, Principle of Operation, Single-phase to Single-phase Cycloconverter Feeding RL Load
Week 10	Three-phase to Single-phase Cycloconverter, Three-phase to Three-phase Cycloconverter, Output Voltage Equation, Effect of Source Inductance, Solved Examples
Week 11	Inverter: Classification, Parallel Inverters, Basic Parallel Inverter, Modified Parallel Inverter. Series Inverters 253: Basic Series Inverter 253, Modifications of Series Inverter
Week 12	Single-phase Bridge Voltage Source Inverter 256, Single-phase Half Bridge Inverter 256, Single-phase Full Bridge Inverter 259, Steady State Response of Single-phase Inverters, Force Commutated Thyristor Inverter, McMurray Inverter (Auxiliary Commutated Inverter) 261 Modified McMurray Full Bridge Inverter, McMurray-Bedford Half Bridge Inverter (Complementary Impulse Commutated Inverter)
Week 13	Three-phase Bridge Inverters: Three-phase Inverter under 180° Mode Operation, Three-phase Inverter under 120° Mode Operation. Voltage Control in Single-phase Inverters, External Control of the AC Output Voltage, External Control of the DC Input Voltage Through Variable DC Link

Week 14	Voltage Control in Single-phase Inverters: Internal Control of the Inverter Voltage, Pulse Width Modulated Inverters. Voltage Control of Three-phase Inverter
Week 15	Harmonic Reduction in the Output Voltage, Harmonic Reduction by Transformer Connections Harmonic Reduction by Multiple Commutation in Each Half Cycle. Current Source Inverter. Single-phase Capacitor Commutated Current Source Inverter with R Load., Single-phase Auto-sequential Commutated Inverter (One-phase ASCI), Three-phase Current Source Inverter
Week 16	Final Exam

Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

	Material Covered
Week 1	V-I characteristics of SCR and measure latching and holding currents.
Week 2	trigger circuit for half wave and full wave control
Week 3	single-phase half wave controlled rectified with resistive load with and without freewheeling diode.
Week 4	single-phase half wave controlled rectified with inductive load with and without freewheeling diode.
Week 5	single phase fully controlled bridge rectifiers with resistive and inductive loads.
Week 6	single phase half-controlled bridge rectifiers with resistive and inductive loads.
Week 7	three-phase fully/half-controlled bridge rectifier with resistive and inductive loads.
Week 8	DC to DC step down chopper
Week 9	DC to Dc step up chopper
Week 10	Single phase half wave AC voltage regulator
Week 11	Single phase full wave AC voltage regulator
Week 12	Three phase full wave AC regulator
Week 13	Three phase to single phase Cycloconverter
Week 14	Half wave Inverter

Week 15	H-Inverter
Week 16	Final Exam

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Power Electronics Devices and Circuits, V. Jagannathan, 2011	Yes
Recommended Texts	. M D Singh, K B Kanchandhani, "Power Electronics", Tata Mc Graw Hill Publishing Company, 2nd Edition, 1998. 2. Dr. P S Bimbhra, "Power Electronics", Khanna Publishers, 5th Edition, 2012. 3. Ned Mohan, Tore M Undeland, William P Robbins, "Power Electronics: Converters, Applications and Design"	No
Websites	https://cae.tu.edu.iq/ed/electronic-lectures.html	

APPENDIX:

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	مقبول بقرار	(45-49)	More work required but credit awarded
	F - Fail	راسب	(0-44)	Considerable amount of work required
Note:				

	Ministry of Higher Education and Scientific Research - Iraq University of Tikrit College of Engineering-Shirqat Departments of Engineering collage	

MODULE DESCRIPTOR

وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**DIGITAL SYSTEM DESIGN**			**Module Delivery**	
Module Type	**BASIC**			☒ Theory ☐ Lecture ☐ Lab ☐ Tutorial ☐ Practical ☐ Seminar	
Module Code	**TUSHEE4102**				
ECTS Credits	**6**				
SWL (hr/sem)	**150**				
Module Level	**4**		**Semester (s) offered**		**7**
Administering Department	**Electrical**		**College**	**Engineering- Shirqat**	
Module Leader	**Adnan Ali Abdullah**		**e-mail**	adnan.ali23@tu.edu.iq	
Module Leader's Acad. Title	**Assistant Lecturer**		**Module Leader's Qualification**		**MSc**
Module Tutor	**Adnan Ali Abdullah**		**e-mail**	adnan.ali23@tu.edu.iq	
Peer Reviewer Name	**Kamil Jadu Ali**		**e-mail**	kmil.ali78@tu.edu.iq	

Review Committee Approval	01/06/2023	**Version Number**	1.0

Relation With Other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	TUSHEE1201	**Semester**	2
Co-requisites module	None	**Semester**	-
Module Aims, Learning Outcomes, Indicative Contents and Brief Description أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية مع وصف مختصر			
Module Aims أهداف المادة الدراسية	1. Understand the principles and applications of bistable, monostable, and astable multivibrators. 2. Explore the principles and applications of sequence generators. 3. Apply the knowledge of timing circuits to design and analyze various electronic systems. 4. Learn about Algorithm State Machine (ASM) and its significance in system design. 5. Apply the concepts of synchronous systems to analyze and design digital circuits and systems. 6. Understand the working principles and applications of Digital to Analog Converters (DAC) and Analog to Digital Converters (ADC). 7. Explore different types of digital devices such as memories (ROM, EEPROM, RAM), Look-Up Tables (LUT), Programmable Logic Devices (PLD), Field Programmable Gate Arrays (FPGA), and their applications. 8. Learn the VHDL language for hardware design and simulation. 9. Gain knowledge of logic circuits, logic families, and zero-crossing detectors. 10. Design digital instruments and analyze their applications.		
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	**LO1.** Understand the principles and operation of bistable, monostable, and astable multivibrators. **LO2.** Apply the principles of sequence generators in various applications. Design timing circuits to meet specific requirements. **LO3.** Apply Algorithm State Machines (ASM) to model and analyze synchronous systems. **LO4.** Design synchronous systems using appropriate design methodologies. **LO5.** Understand the working principles and applications of Digital to Analog Converters (DAC) and Analog to Digital Converters (ADC).		

	LO6. Evaluate different types of digital devices, including memories (Mask ROM, EEPROM, RAM), Look-Up Tables (LUT), Programmable Logic Devices (PLD), and Field Programmable Gate Arrays (FPGA). **LO7.** Utilize the VHDL language for hardware design and simulation. **LO8.** Understand the fundamentals of logic circuits and various logic families. **LO9.** Apply logical operations and design techniques to implement digital systems. **LO10.** Understand the principles and applications of zero-crossing detectors in electronic circuits. **LO11.** Apply zero-crossing detectors for accurate signal detection and measurement.
Indicative Contents المحتويات الإرشادية	Indicative contents include the following. 1. Introduction to Timing Circuits (Bistable, Monostable and A stable Multiviberators, Sequence Generators principles & applications). (1٠ hours) 2. Analysis and Design of Synchronous Systems: Finite State Machines and Algorithm State machine (ASM) with applications. (1٠ hours) 3. Hardware Design of Micro Computers Microprocessors: Digital to Analogue (DAC) and Analogue to Digital Converters (ADC): Types and applications. (10 hours) 4. Digital devices: Memories, Mask ROM, EEPROM, RAM, LUT, PLD, FPGA, VHDL Language. (٥ hours) 5. Logic circuits, logic families Zero – crossing detector (٥ hours) 6. Design of digital instruments with applications (٥ hours)
Course Description	This course provides an understanding of various essential topics in the field of digital electronics and microprocessor systems. Students will explore the fundamental concepts and practical applications of timing circuits, including bistable, monostable, and astable multivibrators, as well as sequence generators. The course also focuses on the analysis and design of synchronous systems, covering finite state machines and algorithm state machines (ASM) with their real-world applications. In addition, students will delve into the hardware design aspects of microcomputers and microprocessors, specifically examining digital-to-analog converters (DAC) and analog-to-digital converters (ADC), their types, and applications. They will gain hands-on experience with digital devices such as memories (including mask ROM, EEPROM, and RAM), look-up tables (LUT), programmable logic devices (PLD), and field programmable gate arrays (FPGA). The course will also introduce students to the VHDL language for hardware design and simulation.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The teaching of the course is delivered through a combination of lectures, online lectures, tutorials, exercises, and laboratory work.

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	63	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4.2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	87	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	5.8
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	150		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	4	20 % (20)	3, 6, 9, 12	All LO
	Assignments	4	5% (5)	Continuous	All LO
	Lab.	0	10% (10)	Continuous	All LO
	Report	12	5% (5)	Continuous	All LO

Summative assessment	**Midterm Exam**	2 hr	10% (10)	7	LO # 1-5
	Final Exam	3 hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Timing circuits • ntroduction to timing circuits and their importance in electronic systems. • Bistable multivibrators: principles, operation, and applications. • Monostable multivibrators: principles, operation, and applications.
Week 2	Timing circuits • Astable multivibrators: principles, operation, and applications. • Sequence generators: principles, types, and applications.
Week 3	Analysis and Design of Synchronous Systems: • Introduction to synchronous systems and their characteristics. • Finite state machines: concepts, representation, and analysis.
Week 4	Analysis and Design of Synchronous Systems: • Algorithm State Machine (ASM): significance and advantages in system design. • Application of ASM in developing efficient synchronous systems.
Week 5	Hardware Design of Micro Computers Microprocessors: • Digital-to-Analog Converters (DAC): principles, types, and applications.
Week 6	Hardware Design of Micro Computers Microprocessors: • Analog-to-Digital Converters (ADC): principles, types, and applications.
Week 7	Digital devices: • Overview of different types of memories: Mask ROM, EEPROM, and RAM.

Week 8	Digital devices: • Look-Up Tables (LUT): functions and applications. • Programmable Logic Devices (PLD) and their role in digital design.
Week 9	Digital devices: • Field Programmable Gate Arrays (FPGA): architecture and applications. • Introduction to VHDL language for hardware design and simulation.
Week 10	Logic circuits and logic families: • Fundamentals of logic circuits and gates. • Analysis and design of logic circuits using different logic families.
Week 11	Logic circuits and logic families: • Introduction to zero-crossing detectors: principles and applications.
Week 12	Design of digital instruments: • Understanding the requirements and applications of digital instruments.
Week 13	Design of digital instruments: • Design principles and techniques for digital instruments.
Week 14	• Recap of all topics covered. • Hands-on exercises and projects related to timing circuits, synchronous systems, microprocessors, digital devices, logic circuits, zero-crossing detectors, and digital instrument design.
Week 15	Preparing for Final Exam
Week 16	**Final Exam**

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	**Digital Fundamentals By** Thomas Floyd	Yes

Recommended Texts	Monk, S. (2016). Programming FPGAs: Getting Started with Verilog. McGraw Hill Professional. 2. FPGAs For Dummies, 2nd Intel Special Edition Published by John Wiley & Sons, Inc 3. Harris, S., & Harris, D. (2012). Digital design and computer architecture Morgan Kaufmann. 4. Andina, J. J. R., De la Torre Arnanz, E., & Valdes, M. D. (2017). FPGAs: fundamentals, advanced features, and applications in industrial electronics. CRC Press.	No
Websites		

APPENDIX:

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	مقبول بقرار	(45-49)	More work required but credit awarded
	F - Fail	راسب	(0-44)	Considerable amount of work required
Note:				

NB 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.

	Ministry of Higher Education and Scientific Research - Iraq University of Tikrit College of Engineering-Shirqat Departments of Engineering collage	

MODULE DESCRIPTOR

وصف المادة الدراسية

Module Information معلومات المادة الدراسية				
Module Title	**GRADUATION PROJECT I**		**Module Delivery**	
Module Type	**C-CORE**		☒ Theory ☐ Lecture ☐ Lab ☐ Tutorial ☒ Practical ☐ Seminar	
Module Code	**TUSHEE4103**			
ECTS Credits	**4**			
SWL (hr/sem)	**100**			
Module Level	**4**	**Semester (s) offered**		**7**
Administering Department	**Electrical**	**College**	**Engineering- Shirqat**	
Module Leader	**Ayad Atiyah Abdulkafi**	**e-mail**	ayad_atiyah@tu.edu.iq	
Module Leader's Acad. Title	**Assistant Professor**	**Module Leader's Qualification**		**PhD**
Module Tutor	**Academic Staff**	**e-mail**		

Peer Reviewer Name	**Ayad Atiyah Abdulkafi**	**e-mail**	ayad_atiyah@tu.edu.iq
Review Committee Approval	01/06/2023	**Version Number**	1.0

Relation With Other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None	**Semester**	-
Co-requisites module	None	**Semester**	-

Module Aims, Learning Outcomes, Indicative Contents and Brief Description أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية مع وصف مختصر	
Module Aims أهداف المادة الدراسية	The main aim of this course is to prepare students for the practical tasks of the workplace after graduation. This includes building his/her ability to perform a complete project.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	Upon completion of this course, the student should be able to: **LO12.** Structure a working schedule for the project. **LO13.** Present Clear aim and objectives of the graduation project. **LO14.** Present the literature review with relation to the selected topic. **LO15.** Develop and carry out the design (or any topic selected). **LO16.** Participate in teamwork activities. **LO17.** Implement the techniques of oral and written presentations. **LO18.** Identify an engineering problem and assess alternative solutions. **LO19.** Apply project management fundamentals. **LO20.** Understand the ethics of the engineering profession. **LO21.** Interact with industry, and related NGOs. **LO22.** Write a technical report. **LO23.** Defend the technical report in front of a committee and be able to answer questions asked by the committee members.
Indicative Contents المحتويات الإرشادية	Indicative contents include the following. 7. Introduction to Timing Circuits (Bistable, Monostable and A stable Multiviberators, Sequence Generators principles & applications). (12 hours)

	8. Analysis and Design of Synchronous Systems: Finite State Machines and Algorithm State machine (ASM) with applications. (12 hours) 9. Hardware Design of Micro Computers Microprocessors: Digital to Analogue (DAC) and Analogue to Digital Converters (ADC): Types and applications. (10 hours) 10. Digital devices: Memories, Mask ROM, EEPROM, RAM, LUT, PLD, FPGA, VHDL Language. (8 hours) 11. Logic circuits, logic families Zero – crossing detector (3 hours) 12. Design of digital instruments with applications (3 hours)
Course Description	Preparatory studies of the literature and data collection for the graduation project in a particular area of concentration and under the supervision of one of the academic staff members. The course covers directed readings in the literature of Electrical engineering, introduction to research methods, seminar discussions dealing with special engineering topics of current interest. Planning, design, construction and management of an engineering project. Writing a technical report.
Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The teaching of the course is delivered through a combination of lectures, online lectures, tutorials, exercises, seminar discussions and laboratory work.

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	33	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	2.2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	67	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	4.4
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	100		

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

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Project management
Week 2	Project management
Week 3	Project research question proposal
Week 4	Project management
Week 5	Project management
Week 6	Project management
Week 7	Project report submission

Week 8	Midterm Exam
Week 9	Project management
Week 10	Project management
Week 11	Project first presentation
Week 12	Project management
Week 13	Project management
Week 14	Project management
Week 15	Presentation to the review board and oral examination
Week 16	**Final Exam**

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Will be required depending on the recommendation of the project supervisor and according to the needs of the specific project topics.	NA
Recommended Texts		NA
Websites		

APPENDIX:

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	مقبول بقرار	(45-49)	More work required but credit awarded
	F - Fail	راسب	(0-44)	Considerable amount of work required

	Ministry of Higher Education and Scientific Research - Iraq University of Tikrit College of Engineering-Shirqat Departments of Engineering collage	

MODULE DESCRIPTOR

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	**TUSHEE4200**				
ECTS Credits	**5**				
SWL (hr/sem)	**125**				
Module Level	**4**	**Semester (s) offered**		**8**	
Administering Department	**Electrical**	**College**	**Engineering- Shirqat**		

Module Leader	**Ayad Atiyah Abdulkafi**	**e-mail**	ayad_atiyah@tu.edu.iq
Module Leader's Acad. Title	**Assistant Professor**	**Module Leader's Qualification**	**PhD**
Module Tutor	**Ayad Atiyah Abdulkafi**	**e-mail**	ayad_atiyah@tu.edu.iq
Peer Reviewer Name	**Asst Prof Dr. Khamees Kh. Hasan**	**e-mail**	kaljomaily@tu.edu.iq
Review Committee Approval	01/06/2023	**Version Number**	1.0

Relation With Other Modules

العلاقة مع المواد الدراسية الأخرى

Prerequisite module	TUSHEE3102	**Semester**	5
Co-requisites module	None	**Semester**	-

Module Aims, Learning Outcomes, Indicative Contents and Brief Description

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية مع وصف مختصر

Module Aims أهداف المادة الدراسية	21. Understand the concept of Entropy, Rate of information and order of the source with reference to dependent and independent source. 22. Study various source encoding algorithms. 23. Model discrete & continuous communication channels. 24. Study various error coding algorithms. 25. Understand the principles of Digital Signals in both the time and frequency domains and use the Fourier Transform, the Fast Fourier Transform and the Z-Transform to analyze such signals. 26. Employ standard methods to design filters for use in processing digital signals. 27. Comprehensively understand how DSP techniques can be used in Instrumentation and Measurement and modern communication systems.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	At the end of this course, the students will be able to **LO27.** Understand the principles of coding techniques used in digital communication systems. **LO28.** Relate the information with the probabilities and its types. **LO29.** calculate the information content of a random variable from its probability distribution.

	LO30. Relate the joint, conditional, and marginal entropies of variables in terms of their coupled probabilities. **LO31.** Define channel capacities and properties using Shannon's Theorems. **LO32.** Construct efficient codes for data on imperfect communication channels. **LO33.** Understand source encoding and efficient communication schemes. **LO34.** Implement the various types of source coding algorithms and analyze their performance. **LO35.** Explain various methods of generating and detecting different types of error correcting codes. **LO36.** Describe channel coding schemes, and efficient coding and other representations for data. **LO37.** Design linear block codes and cyclic codes (encoding and decoding).
Indicative Contents المحتويات الإرشادية	Indicative contents include the following. **Information Theory and Coding (30 hours)** 1. Information Theory: Self-information, source entropy and source entropy rate, mutual information, channel model BSC and TSC, joint and conditional, entropies, capacity and efficiency of symmetric and nonsymmetrical discrete channels. Optimum threshold setting, Capacity of continuous channel (Shannon eq). (10 Hours) 2. Source Coding: Efficiency and redundancy of a code, fixed length codes, variable length codes, Fano code, Huffman code, Shannon code, Non-binary source coding, Source extension for higher coding efficiency. (10 hours). 3. Channel coding. Even and odd parity error of detecting codes, prob. of undetected errors, error, correcting codes, linear block codes (generator and parity check matrices), hamming distance, hamming weight hamming boundary, and error correction capabilities. Decoding of linear block codes (syndromes). Cyclic codes: generator polynomial, nonsystematic code (multiplication), systematic cyclic code (division), and realization logic circuit for encoding and decoding of systematic cyclic codes, Convolutional codes. (10 hours)
Course Description	This course also introduces the principles and applications of information theory: how information is measured in terms of probability and various entropies, how these are used to calculate the capacity of communication channels. Source coding schemes are also presented in this course to measure how much efficiency and redundancy reveal about each other. Channel Coding schemes including error correcting codes are studied in detail at the end of this course.
Learning and Teaching Strategies	

استراتيجيات التعلم والتعليم	
Strategies	The teaching of the course is delivered through a combination of lectures, online lectures, tutorials, exercises, and laboratory work.

Student Workload (SWL)

الحمل الدراسي للطالب

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	63	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4.2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	62	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	4.1
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	125		

Module Evaluation

تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	٤	٢٠% (٢٠)	٣, 6, 9, 12	LO# 1-9
	Assignments	٤	٥% (٥)	Continuous	All LO
	Lab.	١٢	10% (10)	Continuous	All LO
	Report	١٢	٥% (٥)	Continuous	All LO
Summative assessment	Midterm Exam	2 hr	10% (10)	7	LO # 1-5
	Final Exam	3 hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Information Theory: Review Of Probability,
Week 2	Self-Information, Source Entropy, Source Entropy Rate, Mutual Information,
Week 3	Transinformation, Marginal Entropies, Joint and conditional Entropies.
Week 4	Channels Types and Venn Diagram, Channel Capacity, Efficiency and Redundancy and Cascading of Channels
Week 5	Source Coding: Source Coding of Discrete Sources, Coding Efficiency and Redundancy Fixed Length Codes
Week 6	Variable Length Codes: Shannon Codes
Week 7	Shannon-Fano Codes (Fano Codes) and Huffman Codes
Week 8	Midterm Exam
Week 9	Channel Coding and Error Correcting Codes
Week 10	Error Detecting and Correcting Codes
Week 11	Systematic and Non-Systematic Codes, Hamming Distance, Hamming Weight, Hamming Bound
Week 12	Linear and Non-Linear Block Codes,
Week 13	Hamming Codes, Encoding and Decoding
Week 14	Cyclic Codes, Encoding and Implementation
Week 15	Cyclic Codes Decoding and Implementation
Week 16	**Final Exam**

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

Week 1	MATLAB program for Entropy and Mutual Information for Binary Symmetric Channel
Week 2	Source Entropy and Rate
Week 3	Marginal and Joint entropies: Conditional entropies and Transinformation
Week 4	Binary symmetric channel
Week 5	Shannon code
Week 6	Huffman Code
Week 7	Channel Coding
Week 8	Linear Block Code

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Information and Coding Theory, Gareth A. jones and j. Mary jones. Springer, 2000.	Yes
Recommended Texts	Information Transmission, Modulation, and Noise, M Schwartz, 1990.	No
Websites	https://cae.tu.edu.iq/ed/electronic-lectures.html	

APPENDIX:

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	مقبول بقرار	(45-49)	More work required but credit awarded
	F - Fail	راسب	(0-44)	Considerable amount of work required
Note:				

	Ministry of Higher Education and Scientific Research - Iraq University of Tikrit College of Engineering-Shirqat Departments of Engineering collage	

MODULE DESCRIPTOR

وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**POWER SYSTEM ANALYSIS AND PROTECTIONS**			**Module Delivery**	
Module Type	**CORE**			☒ Theory ☐Lecture ☐Lab ☒ Tutorial ☐ Practical ☐ Seminar	
Module Code	**TUSHEE4201**				
ECTS Credits	**8**				
SWL (hr/sem)	**200**				
Module Level	**4**		**Semester (s) offered**		**8**
Administering Department	**Electrical**		**College**	**Engineering- Shirqat**	

Module Leader	**Ghanim Thiab Hasan**	**e-mail**	ghanim_hassan@tu.edu.iq
Module Leader's Acad. Title	**Assistant Professor**	**Module Leader's Qualification**	**Msc.**
Module Tutor	**Ghanim Thiab Hasan** **Kamil Jadu Ali**	**e-mail**	ghanim_hassan@tu.edu.iq kmil.ali78@tu.edu.iq
Peer Reviewer Name	**Asst Prof Dr. Khamees Kh. Hasan**	**e-mail**	kaljomaily@tu.edu.iq
Review Committee Approval	01/06/2023	**Version Number**	1.0

Relation With Other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	TUSHEE1200	**Semester**	2
Co-requisites module	None	**Semester**	-
Module Aims, Learning Outcomes, Indicative Contents and Brief Description أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية مع وصف مختصر			
Module Aims أهداف المادة الدراسية	11. Understand the analysis of power system and its modeling techniques. 12. Understanding and analyzing the node equation. 13. Understanding the principles of synchronous machine in power plant. 14. Study and analysis the per-unit system. 15. Understand the phase faults calculations. 16. Understanding the symmetrical components (symmetrical components of unsymmetrical phases. 17. Analyzing the power in terms of symmetrical components , sequence impedance of sequence network, +ve, -ve, and zero sequence network). 18. Analyzing the power in terms the unsymmetrical faults (L-G, L-L, L-L-G faults, unsymmetrical faults on power system). 19. Understanding the Load Flow Solution.		

	20. Understanding the Gauss Sidel method. 21. Understanding the Newton - Raphson method. 22. Analyzing the data for load flow studies. 23. Introduction to power system stability. 24. Study and analysis the stability problem. 25. Understand the rotor dynamics and swing equation. 26. Analyzing the power angle equation. 27. Understanding the equal-area criterion of stability. 28. Analyzing the multi machine stability studies. 29. Understanding the step-by-step solution. 30. Understand the power system protection system. 31. Understanding the objectives, bus configurations, system components, current transformers, voltage transformers. 32. Understanding the overcurrent protection, overcurrent relays, fuses, radial system protection, directional relays applied to 2-source. 33. Understanding the distance protection principle, stepped protection, R-X. 34. Understanding the differential protection, differential relay, Bus protection, Machine winding protection, 35. Understanding the transformer protection.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	On successful completion of the course students will be able to: **LO11.** Study and analysis the Power System Modeling. **LO12.** Analysis the Node equation, synchronous machine in power plant, The per-unit system. **LO13.** Understanding the fault detection and calculations, **LO14.** Identify the types of power system fault types such as phase faults, symmetrical components (symmetrical components of unsymmetrical phases, power in terms of symmetrical components , sequence impedance of sequence network, +ve, -ve, and zero sequence network), unsymmetrical faults (L-G, L-L, L-L-G faults, unsymmetrical faults on power system). **LO15.** Understanding the load flow solution methods such as : Gauss sidel method, Newton - Raphson method, data for load flow studies.

	LO16. Understanding the power system stability , the stability problem, rotor dynamics and swing equation , power angle equation, equal-area criterion of stability, multi machine stability studies , step-by-step solution. **LO17.** Understanding the power system protection principles ,Objectives, Bus configurations, System components, Current transformers, Voltage Transformers. **LO18.** Understanding the overcurrent protection principles ,Overcurrent Protection of Lines , Overcurrent Relays, Fuses, Radial system protection, Directional relays applied to 2-source.' **LO19.** Understanding the principles of Distance Protection of Lines ,Stepped protection, R-X. **LO20.** Understanding the principles of Differential Protection, differential relay, Bus protection, Machine winding protection. **LO21.** Understanding the Transformer Protection principles, Overcurrent, differential.
Indicative Contents المحتويات الإرشادية	Indicative contents include the following. **Part A: Electrical power system analysis (44 hours)** 6. Introduction to the analysis methods. Introduction to node equation , synchronous machine in power plant , per-unit system analysis. (12 hours). 7. Identify the types of power system fault types such as phase faults, symmetrical components (symmetrical components of unsymmetrical phases (8 hours). 8. Power in terms of symmetrical components, sequence impedance of sequence network, +Ve, -Ve, and zero sequence network (8 hours), unsymmetrical faults (l-g, l-l, l-l-g faults, unsymmetrical faults on power system) (4 hours). 9. The load flow solution methods such as: Gauss Sidel method, Newton - Raphson method, data for load flow studies (4 hours). 10. Power system stability, the stability problem, rotor dynamics and swing equation, power angle equation, equal-area criterion of stability, multi machine stability, step-by-step solution (8 hours). **Part B : Power system protection (31 hours)** 11. The power system protection principles, objectives, bus configurations, system component. (12 hours). 12. Types of protection (3 hours). 13. Current transformers (4 hours). 14. Voltage transformers (4 hours). 15. Line, bus bar protection (4 hours). 16. Transfer protection (4 hours).

Course Description	This course aims to enable students to be familiar with fundamental concepts and issues, to develop good understanding the principles of power system analysis, to perform simple analysis and assessment of system performance. From a system engineering perspective, we will find that the developments and advances of electrical power technologies are closely related to those of electrical engineering. For students who undertake studies in fields other than electrical and power generation. This course will provide an in-depth overview of the fundamentals as well as modern techniques and systems in the electrical power generation and distribution fields.
Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The teaching of the course is delivered through a combination of lectures, online lectures, tutorials, exercises works.

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	93	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	6.2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	107	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	7.1
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	6	30 % (30)	3, 6, 9, 12	All LO
	Assignments	10	10% (10)	Continuous	All LO
	Lab.				
	Report			Continuous	All LO
Summative assessment	Midterm Exam	2 hr	10% (10)	7	LO # 1-5
	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 node equation.
Week 2	Introduction to per unit system.
Week 3	power system fault types such as phase faults, symmetrical components (symmetrical components of unsymmetrical phases.
Week 4	symmetrical components, sequence impedance of sequence network, +Ve, -Ve, and zero sequence network(4 hours),
Week 5	unsymmetrical faults (l-g, l-l, l-l-g faults, unsymmetrical faults on power system)
Week 6	load flow solution methods such as: Gauss Sidel method, Newton - Raphson method, data for load flow studies
Week 7	Power system stability, the stability problem, rotor dynamics and swing equation, power angle equation, equal-area criterion of stability, multi machine stability, step-by-step solution
Week 8	The power system protection principles, objectives,
Week 9	bus configurations, system component
Week 10	Current transformers.

Week 11	Voltage transformers.
Week 12	Bus bar protection.
Week 13	Transfer protection.
Week 14	Transmission line protection.
Week 15	Preparing for Final Exam
Week 16	**Final Exam**

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Power Systems Analysis, second edition, by Arturo R. Bergen and Vijay Vittal. (Prentice HallInc.,2 000, ISBN0-13-691990-1, 619 pages.	Yes
Recommended Texts	Power System Stability and Control,P.Kundur,(McGraw-Hill,New York,1994.ISBN0-07-035958-X	No
Websites	https:// 0136919901 ‹ www.amazon.com. https //Power-System... ‹ 2018/01 ‹ .uploads ‹ wp-content ‹ powerunit-ju.com	

APPENDIX:

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	مقبول بقرار	(45-49)	More work required but credit awarded

(0 - 49)	F - Fail	راسب	(0-44)	Considerable amount of work required
Note:				

	Ministry of Higher Education and Scientific Research - Iraq University of Tikrit College of Engineering-Shirqat Departments of Engineering collage	

MODULE DESCRIPTOR

وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**DIGITAL SIGNAL PROCESSING (DSP)**			**Module Delivery**	
Module Type	**CORE**			☒ Theory ☐ Lecture ☒ Lab ☐ Tutorial ☐ Practical ☐ Seminar	
Module Code	**TUSHEE4202**				
ECTS Credits	**5**				
SWL (hr/sem)	**125**				
Module Level	**4**		**Semester (s) offered**		**8**
Administering Department	**Electrical**		**College**	**Engineering- Shirqat**	
Module Leader	**Ayad Atiyah Abdulkafi**		**e-mail**	ayad_atiyah@tu.edu.iq	

Module Leader's Acad. Title	**Assistant Professor**	**Module Leader's Qualification**	**PhD**
Module Tutor	**Ayad Atiyah Abdulkafi**	**e-mail**	ayad_atiyah@tu.edu.iq
Peer Reviewer Name	**Asst Prof Dr. Khamees Kh. Hasan**	**e-mail**	kaljomaily@tu.edu.iq
Review Committee Approval	01/06/2023	**Version Number**	1.0

Relation With Other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	TUSHEE1201	**Semester**	2
Co-requisites module	None	**Semester**	-

Module Aims, Learning Outcomes, Indicative Contents and Brief Description

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية مع وصف مختصر

Module Aims أهداف المادة الدراسية	28. Understand the principles of Digital Signals in both the time and frequency domains and use the Fourier Transform, the Fast Fourier Transform and the Z-Transform to analyze such signals. 29. Employ standard methods to design filters for use in processing digital signals. 30. Comprehensively understand how DSP techniques can be used in Instrumentation and Measurement and modern communication systems.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	At the end of this course, the students will be able to **LO38.** Develops a good understanding of modeling and analysis discrete-time signals and systems. **LO39.** Understanding of signals and its classifications **LO40.** Describe the characteristics and transformations of discrete time signals mathematically. **LO41.** Understanding of systems and its classifications **LO42.** Apply techniques in time and transform domains to the analysis and design of discrete-time systems. **LO43.** Works with mathematical tools (z-Transform, difference equations) to have an in-depth understanding of discrete-time signals and systems.

	LO44. Use spectral analysis (Fourier analysis: DTFT, DFT) to analyze signals and systems. **LO45.** Studies, understands and works with A/D, D/A conversion processes. **LO46.** Studies digital filter design techniques. **LO47.** Design digital filters and apply them to real-world applications of signal and information processing.
Indicative Contents المحتويات الإرشادية	Indicative contents include the following. **DSP (30 Hours)** **22.** Introduction to Digital Signal Processing (DSP) , Digital Signals and Systems: Common Types and Generation of DS. Basic concepts: linear, time variant, stable and casual discrete systems. Difference equations and impulse response. Input / output relations in Z- domains. Discrete convolution techniques: tabular method, Z- transform method, matrix method, add overlap method. De-convolution methods': iterative method and Z-transform method, frequency response of discrete system. (10 hours) **23.** Discrete Fourier transform (DFT): Definition and properties of DFT, Matrix formulation of the DFT., Fast Fourier transform. (FFT), decimation in time (DIT), decimation in frequency (DIF), arithmetic complexity (10 hours). 24. Digital Filter Design: Classification and realization of discrete system (FIR and IIR systems), Review of analogue filter design (Butterworth and Chebyshev filter), IIR filter design using analogue filters and the bilinear transformation, filter transformation for IIR (LPF/ LPF, LPF/HPF, LPF/BPF, LPF/BSF). FIR filter design using windows, Rectangular, Bartlett, Hanning, Hamming and Blackman windows, LPF, HPF, BPF and BSF FIR filter. (10 hours)
Course Description	This course provides an introduction to processing of discrete-time (DT) signals. Fundamental principles of DT systems and signals, in both time and Fourier domains, are presented. These are followed by modern applications of digital signal processing in electronic, computer and information engineering. Throughout the course, the focus is on developing techniques and algorithms for solving discrete-time signal processing problems.
Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The teaching of the course is delivered through a combination of lectures, online lectures, tutorials, exercises, and laboratory work.

Student Workload (SWL) الحمل الدراسي للطالب

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	63	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4.2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	62	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	4.1
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	125		

Module Evaluation

تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	٤	٢٠% (٢٠)	٣, 6, 9, 12	LO# 1-9
	Assignments	٤	٥% (٥)	Continuous	All LO
	Lab.	١٢	10% (10)	Continuous	All LO
	Report	١٢	٥% (٥)	Continuous	All LO
Summative assessment	Midterm Exam	2 hr	10% (10)	7	LO # 1-5
	Final Exam	3 hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered

Week 1	Digital Signals (DS): Common Types and Generation of DS.
Week 2	Basic concepts: linear, time variant, stable and casual discrete systems.
Week 3	Difference equations and impulse response. Input / output relations in Z- domains.
Week 4	Discrete convolution techniques: tabular method, Z- transform method, matrix method, add overlap method.
Week 5	De-convolution methods': iterative method and Z-transform method, frequency response of discrete system.
Week 6	Definition and properties of DFT,
Week 7	Matrix formulation of the DFT, Fast Fourier transform. (FFT)
Week 8	Midterm
Week 9	Decimation in time (DIT), decimation in frequency (DIF), arithmetic complexity.
Week 10	Classification and realization of discrete system (FIR and IIR systems),
Week 11	Review of analogue filter design (Butterworth and Chebyshev filter), IIR
Week 12	filter design using analogue filters and the bilinear transformation, filter
Week 13	transformation for IIR (LPF/ LPF, LPF/HPF, LPF/BPF, LPF/BSF). FIR
Week 14	filter design using windows, Rectangular, Bartlett, Hanning, Hamming and
Week 15	Blackman windows, LPF, HPF, BPF and BSF FIR filter..
Week 16	**Final Exam**

Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

	Material Covered
Week 1	Getting Started with dealing with signals and systems in MATLAB
Week 2	Signal Generations in MATLAB

Week 3	Verification of Sampling Theorem
Week 4	Discrete Time Systems
Week 5	Impulse Response of a Given System
Week 6	Linear and Circular Convolution of Two Given Sequences
Week 7	DSP using MATLAB

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	An Introduction to Analog and Digital Communication, Simon Haykins, John Wiley India Pvt. Ltd., 2008, ISBN 978-81-265-3653-5.	Yes
Recommended Texts	Modern Digital and Analog Communication Systems, 4th ed.; B.P. Lathi and Zhi Ding; Oxford University Press; 2009. Communication Systems Engineering 2nd Ed by John G. Proakis and Masoud Salehi 2002.	No
Websites	https://cae.tu.edu.iq/ed/electronic-lectures.html	

APPENDIX:

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	مقبول بقرار	(45-49)	More work required but credit awarded
	F - Fail	راسب	(0-44)	Considerable amount of work required
Note:				

	Ministry of Higher Education and Scientific Research - Iraq University of Tikrit College of Engineering-Shirqat Departments of Engineering collage	

MODULE DESCRIPTOR

وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**GRADUATION PROJECT II**			**Module Delivery**	
Module Type	**C-CORE**			☒ Theory ☐ Lecture ☐ Lab ☐ Tutorial ☒ Practical ☐ Seminar	
Module Code	**TUSHEE4203**				
ECTS Credits	**4**				
SWL (hr/sem)	**100**				
Module Level	**4**		**Semester (s) offered**		**7**
Administering Department	**Electrical**		**College**	**Engineering- Shirqat**	

Module Leader	**Ayad Atiyah Abdulkafi**	**e-mail**	ayad_atiyah@tu.edu.iq
Module Leader's Acad. Title	**Assistant Professor**	**Module Leader's Qualification**	**PhD**
Module Tutor	**Academic Staff**	**e-mail**	
Peer Reviewer Name	**Ayad Atiyah Abdulkafi**	**e-mail**	ayad_atiyah@tu.edu.iq
Review Committee Approval	01/06/2023	**Version Number**	1.0

Relation With Other Modules

العلاقة مع المواد الدراسية الأخرى

Prerequisite module	TKSHEE4103	**Semester**	7
Co-requisites module	None	**Semester**	-

Module Aims, Learning Outcomes, Indicative Contents and Brief Description

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية مع وصف مختصر

Module Aims أهداف المادة الدراسية	The main aim of this course is to prepare students for the practical tasks of the workplace after graduation. This includes building his/her ability to perform a complete project.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	Upon completion of this course, the student should be able to: **LO24.** Structure a working schedule for the project. **LO25.** Present Clear aim and objectives of the graduation project. **LO26.** Present the literature review with relation to the selected topic. **LO27.** Develop and carry out the design (or any topic selected). **LO28.** Participate in teamwork activities. **LO29.** Implement the techniques of oral and written presentations. **LO30.** Identify an engineering problem and assess alternative solutions. **LO31.** Apply project management fundamentals. **LO32.** Understand the ethics of the engineering profession. **LO33.** Interact with industry, and related NGOs. **LO34.** Write a technical report. **LO35.** Defend the technical report in front of a committee and be able to answer questions asked by the committee members.

Indicative Contents المحتويات الإرشادية	Indicative contents include the following. 13. Introduction to Timing Circuits (Bistable, Monostable and A stable Multiviberators, Sequence Generators principles & applications). (12 hours) 14. Analysis and Design of Synchronous Systems: Finite State Machines and Algorithm State machine (ASM) with applications. (12 hours) 15. Hardware Design of Micro Computers Microprocessors: Digital to Analogue (DAC) and Analogue to Digital Converters (ADC): Types and applications. (10 hours) 16. Digital devices: Memories, Mask ROM, EEPROM, RAM, LUT, PLD, FPGA, VHDL Language. (8 hours) 17. Logic circuits, logic families Zero – crossing detector (3 hours) 18. Design of digital instruments with applications (3 hours)
Course Description	Preparatory studies of the literature and data collection for the graduation project in a particular area of concentration and under the supervision of one of the academic staff members. The course covers directed readings in the literature of Electrical engineering, introduction to research methods, seminar discussions dealing with special engineering topics of current interest. Planning, design, construction and management of an engineering project. Writing a technical report.
Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The teaching of the course is delivered through a combination of lectures, online lectures, tutorials, exercises, seminar discussions and laboratory work.

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	33	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	2.2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	67	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	4.4
Total SWL (h/sem)	100		

الحمل الدراسي الكلي للطالب خلال الفصل	

Module Evaluation

تقييم المادة الدراسية

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

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	Project management
Week 2	Project management
Week 3	Project research question proposal
Week 4	Project management

Week 5	Project management
Week 6	Project management
Week 7	Project report submission
Week 8	Midterm Exam
Week 9	Project management
Week 10	Project management
Week 11	Project first presentation
Week 12	Project management
Week 13	Project management
Week 14	Project management
Week 15	Presentation to the review board and oral examination
Week 16	**Final Exam**

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	**Available in the Library?**
Required Texts	Will be required depending on the recommendation of the project supervisor and according to the needs of the specific project topics.	NA
Recommended Texts		NA
Websites		

APPENDIX:

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	مقبول بقرار	(45-49)	More work required but credit awarded
	F - Fail	راسب	(0-44)	Considerable amount of work required
Note:				

	Ministry of Higher Education and Scientific Research - Iraq University of Tikrit College of Engineering-Shirqat Departments of Engineering Collage	

MODULE DESCRIPTOR

وصف المادة الدراسية

Module Information معلومات المادة الدراسية		
Module Title	**ENGLISH LANGUAGE IV**	**Module Delivery**
Module Type	**S-SUPPORT OR RELATED LEARNING ACTIVITY**	☒ Theory ☐ Lecture ☐ Lab ☐ Tutorial ☐ Practical
Module Code	**TUSHEE4205**	
ECTS Credits	**2**	

SWL (hr/sem)	**2**	☐ **Seminar**	
Module Level	4	**Semester (s) offered**	**7**
Administering Department	**Electrical**	**College**	**Engineering- Shirqat**
Module Leader	**Khaled Jumah Abdulqader**	**e-mail**	khalid.abdulkadir@tu.edu.iq
Module Leader's Acad. Title	**Assistant Professor**	**Module Leader's Qualification**	**MSc.**
Module Tutor	**Khaled Jumah Abdulqader**	**e-mail**	khalid.abdulkadir@tu.edu.iq
Peer Reviewer Name	Dr. Ayad Atiyah Abdulkafi	**e-mail**	ayad_atiyah@tu.edu.iq
Review Committee Approval	01/06/2023	**Version Number**	1.0

Relation With Other Modules

العلاقة مع المواد الدراسية الأخرى

Prerequisite module	TUSHEE3104	**Semester**	5
Co-requisites module	None	**Semester**	-

Module Aims, Learning Outcomes, Indicative Contents and Brief Description

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية مع وصف مختصر

Module Aims أهداف المادة الدراسية	1.Use the language with accuracy and fluently 2-Integrate themes, structures, function vocabulary and pronunciation 3-Make use of language in real life. 4-Familiarize themselves with conversational language, grammar in communication listening activities high interested reading passages
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	On successful completion of the course students will be able to understand: **LO1.** Use the language with accuracy and fluently Principle operation of dc generator. **LO2.** Integrate themes, structures, function vocabulary and pronunciation Parallel operation of dc generators..

	LO3. Make use of language in real life. Analyze Characteristics and performance of dc motors. **LO4.** Familiarize themselves with conversational language, and grammar in communication listening activities high interested in reading passages
Indicative Contents المحتويات الإرشادية	Indicative contents include the following. English for Engineering is designed to improve the communication skills and specialist language knowledge of engineers, enabling them to work more confidently and effectively. With an emphasis on listening and speaking, the ten standalone units cover topics common to all fields of engineering such as monitoring and control, procedures and precautions, and engineering design. Authentic activities based on everyday engineering situations - from describing technical problems and solutions to working with drawings - make the course practical and motivating. In addition, a set of case studies available online provide problem-solving practice in authentic engineering scenarios.
Course Description	The course is particularly suitable for civil, mechanical and electrical engineers and can be used in the classroom or for self-study.
Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The teaching of the course is delivered through a combination of lectures, online lectures, tutorials, and exercises,.

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	33	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	2.2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	17	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	1.1
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	50		

Module Evaluation

تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	4	10 % (10)	3, 6, 9, 12	LO #2 ,5 ,8, 11
	Assignments	4	15% (15)	Continuous	All LO
	Lab.		% (00)	Continuous	All LO
	Report	8	15% (15)	Continuous	All LO
Summative assessment	Midterm Exam	1 hr	10% (20)	7	LO # 1-6
	Final Exam	2 hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	Technology in use (words stemming from uses verbs adverbs and phrases)
Week 2	Materials technology (common materials made of and adverbs of degree)
Week 3	Components and assemblies (shapes 3D words t describe and prepositions to describe)
Week 4	Engineering design (Phrases related to scale and tolerance and verbs and nouns problems describing design)
Week 5	Breaking point (verbs and adjectives verbs and nouns problems describing reapers
Week 6	Technical developments phrases and idioms

Week 7	Procedures and procreations Types of industrials hazards common language on safety notes
Week 8	**Midterm Exam**
Week 9	Monitoring and control(Words To describe automated
Week	Theory and practice (Words and phrases for agreeing and disagreeing and Words for linking causes and Effects)
Week 11	Pushing the boundaries (Adjectives describing suitability and performance and Words To describe type of forces fact of criteria, criterion,
Week	Answer key
Week 13	**Glossary**
Week 14	**Exercises**
Week 15	**preparing for final exam**
Week 16	**Final Exam**

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	**Available in the Library?**
Required Texts	Mark Ibbotson Cambridge English for Engineering	Yes
Recommended Texts	English Arabic Dictionary of Electric, Electronic and Communication 2016	
	English grammar for engineering students .com	

APPENDIX:

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	مقبول بقرار	(45-49)	More work required but credit awarded
	F - Fail	راسب	(0-44)	Considerable amount of work required

	Ministry of Higher Education and Scientific Research - Iraq University of Tikrit College of Engineering Department of Electrical Engineering	

MODULE DESCRIPTOR

وصف المادة الدراسية

Module Information معلومات المادة الدراسية		
Module Title	**RENEWABLE ENERGY**	**Module Delivery**

Module Type	**ELECTIVE**			☒ Theory ☐ Lecture ☐ Lab ☒ Tutorial ☐ Practical ☐ Seminar	
Module Code	**TUSHEE4104**				
ECTS Credits	**4**				
SWL (hr./sem.)	**100**				
Module Level	4		**Semester (s) offered**	7	
Administering Department	**Electrical Engineering**		**College**	**Engineering- Shirqat**	
Module Leader			**e-mail**		
Module Leader's Acad. Title			**Module Leader's Qualification**		
Module Tutor			**e-mail**		
Peer Reviewer Name	Ayad Atiyah Abdulkafi		**e-mail**	ayad_atiyah@tu.edu.iq	
Review Committee Approval	01/06/2023		**Version Number**	1.0	

Relation With Other Modules

العلاقة مع المواد الدراسية الأخرى

Prerequisite module	TUSHEE3100	**Semester**	1
Co-requisites module	None	**Semester**	-

Module Aims, Learning Outcomes, Indicative Contents and Brief Description

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية مع وصف مختصر

Module Aims أهداف المادة الدراسية	1- To understand the importance of renewable energy resources and its utilization for thermal and electrical energy needs and also the environmental aspects of these resources. 2- Understand the various forms of conventional energy resources. 3- Learn the present energy scenario and the need for energy conservation. 4- Explain the concept of various forms of renewable energy. 5- Outline division aspects and utilization of renewable energy sources for both domestics and industrial application 6- Analyze the environmental aspects of renewable energy resources.

	7- Analysis the environmental conditions effects on the output power of the solar system.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	**LO11.** Understanding the foundation of fundamental of Energy Sources and Environmental Effects **LO12.** Describe the environmental aspects of non-conventional energy resources. In Comparison with various conventional energy systems, their prospects and limitations. **LO13.** Know the need of renewable energy resources, historical and latest developments. **LO14.** escribe the use of solar energy and the various components used in the energy production with respect to applications like - heating, cooling, desalination, power generation, drying, cooking etc. **LO15.** Appreciate the need of Wind Energy and the various components used in energy generation and know the classifications. **LO16.** Understand the concept of Biomass energy resources and their classification, types of biogas Plants- applications. **LO17.** Compare Solar, Wind and bio energy systems, their prospects, Advantages and limitations. **LO18.** Acquire the knowledge of fuel cells, wave power, tidal power and geothermal principles and applications.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following topic each has 5 Hrs including class lectures and tutorials. 1- Energy Sources and Environmental Effects 2- Electrical Fundamentals 3- Solar Photovoltaics 4- Detailed design project using commercial design methods and tools. 5- Applied Renewable Energy for Businesses & Residences 6- Charge Controllers and Inverters 7- Wind Power Fundamentals 8- Biomass Technologies 9- Geothermal Power Generation 10- Hydropower and Fuel Cells. 11- Second class project based on technology to be selected. 12- Generators and Connecting to The Grid
Course Description	This course will focus on the practical application of renewable energy technologies. Topics include energy and resource conservation and project siting, economics, financing, renewable energy and tax credits, technical and engineering aspects, regulatory issues, energy storage, monitoring and verification. Students study the advantages, limitations, and potential of various energy sources. Wind, solar, small-scale hydro, ground-source heat pumps, combined heat and power, biofuels, fuel cells, and other technologies are examined. Students will learn the strategies and cost/benefit analyses employed by energy analysts to meet demand with clean energy production. Students will also complete their own study and proposal for a renewable energy project.
Learning and Teaching Strategies استراتيجيات التعلم والتعليم	

Strategies	The learning and teaching strategy includes Class Participation, Homework Assignments, Project Presentation(s) and Quizzes/Tests

Student Workload (SWL)

الحمل الدراسي للطالب

Structured SWL (h/sem.) الحمل الدراسي المنتظم للطالب خلال الفصل	63	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4.2
Unstructured SWL (h/sem.) الحمل الدراسي غير المنتظم للطالب خلال الفصل	37	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	2.4
Total SWL (h/sem.) الحمل الدراسي الكلي للطالب خلال الفصل	100		

Module Evaluation

تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	4	20 % (20)	3, 6, 9, 12	All LO
	Assignments	4	10% (10)	Continuous	All LO
	Report	5	10% (10)	Continuous	All LO
Summative assessment	**Midterm Exam**	2 hr	10% (10)	8	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	Energy Sources and Environmental Effects
Week 2	Electrical Fundamentals
Week 3	Solar Photovoltaics
Week 4	Solar Power Systems – Electrical
Week 5	Solar Power Systems – Thermal and Mechanical
Week 6	Solar Tracking
Week 7	Detailed design project using commercial design methods and tools
Week 8	Midterm exam
Week 9	Charge Controllers and Inverters
Week 10	Study and analysis the maximum power point tracking charge controller.
Week 11	Biomass Technologies and Geothermal Power Generation
Week 12	Hybrid solar system.
Week 13	Second class project based on technology to be selected
Week 14	Generators and Connecting to The Grid
Week 15	The Big Picture, Putting It All Together
Week 16	Final exam

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Renewable Energy Systems, David Buchla, Thomas Kissell and Thomas, Floyd, Pearson, 2015, ISBN: 978-0-13-262251-6.	Yes

Recommended Texts	Integration of Renewable Sources of Energy, 2nd Edition, Felix A Farret and M. Godoy Simoes, Wiley, 2018, ISBN: 978-1-11-913737-5,	Yes
Websites	https://greencleanguide.com/	

APPENDIX:

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	مقبول بقرار	(45-49)	More work required but credit awarded
	F - Fail	راسب	(0-44)	Considerable amount of work required
Note:				

NB 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.

	Ministry of Higher Education and Scientific Research - Iraq University of Tikrit College of Engineering-Shirqat Departments of Engineering collage	

MODULE DESCRIPTOR

وصف المادة الدراسية

Module Information معلومات المادة الدراسية				
Module Title	Mobile Communications		**Module Delivery**	
Module Type	ELECTIVE		☒ Theory ☐ Lecture ☐ Lab ☐Tutorial ☐ Practical ☐ Seminar	
Module Code	TUSHEE3106			
ECTS Credits	٤			
SWL (hr/sem)	1٠0			
Module Level	٣	**Semester (s) offered**	٥	
Administering Department	**Electrical**	**College**	**Engineering- Shirqat**	
Module Leader	**Ayad Atiyah Abdulkafi**	**e-mail**	ayad_atiyah@tu.edu.iq	
Module Leader's Acad. Title	**Assistant Professor**	**Module Leader's Qualification**	**PhD**	
Module Tutor	**Ayad Atiyah Abdulkafi**	**e-mail**	ayad_atiyah@tu.edu.iq	
Peer Reviewer Name	**Asst Prof Dr. Khamees Kh. Hasan**	**e-mail**	kaljomaily@tu.edu.iq	

Review Committee Approval	01/06/2023	**Version Number**	1.0

Relation With Other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None	**Semester**	-
Co-requisites module	None	**Semester**	-
Module Aims, Learning Outcomes, Indicative Contents and Brief Description أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية مع وصف مختصر			
Module Aims أهداف المادة الدراسية	14. To introduce students to the fundamentals of wireless communication systems and techniques. 15. To describe existing wireless communication systems and standards. 16. To prepare students for understanding systems that will be used in the next generations of wireless communication.		
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	On successful completion of the course students will be able to: **LO25.** have knowledge about the evolution of wireless communication standards. **LO26.** understand wireless communication channels and the fading effect. **LO27.** understand multiple access techniques, wireless network structures, the concepts of cellular communication. **LO28.** understand the concepts of cellular channel assignment, handover, sectoring, power control. **LO29.** understand diversity techniques and multi-antenna systems. **LO30.** understand multicarrier modulation, OFDM, OFDMA techniques. **LO31.** understand basic components of all-IP telecommunication networks. **LO32.** have knowledge about 2nd, 3rd, 4th, 5th generation and beyond wireless communication systems.		
Indicative Contents المحتويات الإرشادية	Indicative contents include the following. 25. Introduction, Basic Concepts, Historical Development, Wireless Communication Systems and Standards (3 Hrs) 26. Channel Models, Path Loss, Shadowing (3 Hrs) 27. Fading, Channel Classifications (3 Hrs) 28. Multiple Access Techniques, FDMA, TDMA (4 Hrs) 29. Spread Spectrum, CDMA (3 Hrs) 30. Cellular Structures, Network Structure, Channel Assignment (3 Hrs) 31. Handover, Sectoring (3 Hrs) 32. Sectoring (Continued), Power Control (3 Hrs)		

	33. Diversity Techniques, MIMO Systems (4 Hrs) 34. Multicarrier Modulation, OFDM, OFDMA (5 Hrs) 35. All-IP Telecommunication Networks (3 Hrs) 36. 2nd and 3rd Generation Wireless Communication Systems (3 Hrs) 37. 4th Generation Wireless Communication Systems (3 Hrs) 38. 5th Generation and Beyond Wireless Communication Systems (3 Hrs)
Course Description	Introduction, Basic Concepts, Historical Development, Wireless Communication Systems and Standards, Channel Models, Path Loss, Shadowing, Fading, Channel Classifications, Multiple Access Techniques, FDMA, TDMA, CDMA, Cellular Structures, Network Structure, Channel Assignment, Handover, Sectoring, Power Control, Diversity Techniques, MIMO Systems, Multicarrier Modulation, OFDM, OFDMA, All-IP Telecommunication Networks, 2nd, 3rd, 4th, 5th Generation and Beyond Wireless Communication Systems.
Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The teaching of the course is delivered through a combination of lectures, online lectures and exercises.

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	48	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	3.2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	52	**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	4	30 % (30)	3, 6, 9, 12	All LO
	Assignments	4	10% (10)	Continuous	All LO
	Lab.				
	Report				
Summative assessment	Midterm Exam	2 hr	10% (10)	7	LO # 1-6
	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, Basic Concepts, Historical Development, Wireless Communication Systems and Standards
Week 2	Channel Models, Path Loss, Shadowing
Week 3	Fading, Channel Classifications
Week 4	Multiple Access Techniques, FDMA, TDMA
Week 5	Spread Spectrum, CDMA
Week 6	Cellular Structures, Network Structure, Channel Assignment
Week 7	Handover, Sectoring
Week 8	Midterm Exam
Week 9	Sectoring (Continued), Power Control

Week 10	Diversity Techniques, MIMO Systems
Week 11	Multicarrier Modulation, OFDM, OFDMA
Week 12	All-IP Telecommunication Networks
Week 13	2nd and 3rd Generation Wireless Communication Systems
Week 14	4th Generation Wireless Communication Systems
Week 15	5th Generation and Beyond Wireless Communication Systems
Week 16	**Final Exam**

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Parsons, J. D. (2012). *Mobile communication systems*. Springer Science & Business Media.	No
Recommended Texts	Osseiran, Afif, Jose F. Monserrat, and Patrick Marsch, eds. *5G mobile and wireless communications technology*. Cambridge University Press, 2016.	No
Websites	https://cae.tu.edu.iq/ed/electronic-lectures.html	

APPENDIX:

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	مقبول بقرار	(45-49)	More work required but credit awarded
(0 - 49)	**F** - Fail	راسب	(0-44)	Considerable amount of work required
Note:				

NB 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.

	Ministry of Higher Education and Scientific Research - Iraq University of Tikrit College of Engineering-Shirqat Departments of Engineering collage	

MODULE DESCRIPTOR

وصف المادة الدراسية

Module Information

معلومات المادة الدراسية					
Module Title	**RADAR SYSTEMS**			**Module Delivery**	
Module Type	**ELECTIVE**			☒ Theory ☐ Lecture ☐ Tutorial ☐ Practical ☐ Seminar	
Module Code	**TUSHEE3204**				
ECTS Credits	**2**				
SWL (hr/sem)	**50**				
Module Level	**3**	**Semester (s) offered**		**6**	
Administering Department	**Electrical**	**College**	**Engineering- Shirqat**		
Module Leader	**Mahmoud Ali**	**e-mail**	mh.dham@tu.edu.iq		
Module Leader's Acad. Title	**Assistant Professor**	**Module Leader's Qualification**		**master**	
Module Tutor	**Mahmoud Ali**	**e-mail**	mh.dham@tu.edu.iq		
Peer Reviewer Name	Ayad Atiyah Abdulkafi	**e-mail**	ayad_atiyah@tu.edu.iq		
Review Committee Approval	01/06/2023	**Version Number**		1.0	

Relation With Other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None	**Semester**	-
Co-requisites module	None	**Semester**	-

Module Aims, Learning Outcomes, Indicative Contents and Brief Description أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية مع وصف مختصر	
Module Aims أهداف المادة الدراسية	1. To learn Radar Fundamentals like Radar Equation, Operating frequencies & Applications. 2. To understand the basic concepts of different types of Radars for surveillance & Tracking. 3. To know the various types of tracking techniques involved. 4. To understand Radar Receivers, MTI filters, displays and antennas.

Module Learning Outcomes مخرجات التعلم للمادة الدراسية	On successful completion of the course students will be able to: 1. Demonstrate an understanding of the factors affecting the radar performance using Radar Range Equation. 2. Analyze the principle of FM-CW radar and apply it in FM-CW Altimeter. 3. Differentiate between a MTI Radar and a Pulse Doppler Radar based on their working principle. 4. Demonstrate an understanding of the importance of Matched Filter Receivers in Radars. 5. Familiarize with the different types of Radar Displays and their application in real time scenario
Indicative Contents المحتويات الإرشادية	Indicative contents include the following. **RADAR SYSTEMS (30 Hours)** 1-Introduction, Basic Principle of Radar, Terminology of Radar Systems(4 hours) 2- **Radar Equation:** SNR, Envelope Detector-False AlarmTime and Probability, Integration of Radar Pulses, Radar Cross Section of Targets (simple targets - sphere, cone- sphere), Transmitter Power, PRF and Range Ambiguities,(6 hours) 3- **CW and Frequency Modulated Radar:** Doppler Effect, CW Radar – Block Diagram, Isolation between Transmitter and Receiver, Non-zero IF Receiver, Receiver Bandwidth Requirements, Applications of CW radar, Related Problems. **FM-CW Radar:** FM-CW Radar, Range and Doppler Measurement, Block Diagram and Characteristics (Approaching/ Receding Targets), FM-CW altimeter, Multiple Frequency CW Radar. (6 hours) 4- **MTI and Pulse Doppler Radar:** Introduction, Principle, MTI Radar with - Power Amplifier Transmitter and Power Oscillator Transmitter, Delay Line Cancellers – Filter Characteristics, Blind Speeds, Double Cancellation, Staggered PRFs. Range Gated Doppler Filters. MTI Radar Parameters, Limitations to MTI Performance, MTI versus Pulse Doppler Radar. **Tracking Radar:** Tracking with Radar, Sequential Lobing, Conical Scan, Monopulse Tracking Radar – Amplitude Comparison Monopulse (one- and two- coordinates), Angular Accuracy, Tracking in Range, Acquisition and Scanning Patterns, Comparison of Trackers.(6 hours) 5- **Detection of Radar Signals in Noise:** Introduction, Matched Filter Receiver – Response Characteristics and Derivation, Correlation Function and Cross-correlation Receiver, Efficiency of Non-matched Filters, Matched Filter with Non-white Noise.(8hours)

Course Description	This course aims to enable students to be familiar with fundamental concepts and issues, to develop good understanding of basic radar systems techniques, to perform simple analysis and assessment of system performance. From a system engineering perspective, we will find that the developments and advances of electricals technologies are closely related to those of electrical engineering and computer engineering. For students who undertake studies in fields other than electrical and telecommunications, this course will provide an in-depth overview of the fundamentals as well as modern techniques and systems in the telecommunication field.
Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The teaching of the course is delivered through a combination of lectures, online lectures,

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	33	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	2.2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	17	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	1.1
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	50		

Module Evaluation تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	25 % (25)	9, , 12	All LO
	Assignments	4	15% (15)		All LO
Summative assessment	Midterm Exam	2 hr	10% (10)	7	LO # 1-5
	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 **Radar Systems – Range Equation**
Week 2	Derivation of Radar Range Equation, Standard Form of Radar Range Equation Performance factors
Week 3	Types of Radars
Week 4	CW and Frequency Modulated Radar
Week 5	MTI and Pulse Doppler Radar**:** Introduction, Principle, MTI Radar with - Power Amplifier
Week 6	Transmitter and Power Oscillator Transmitter, Delay Line Cancellers - Filter Characteristics
Week 7	Blind Speeds, Double Cancellation, Staggered PRFs. Range Gated Doppler Filters. MTI Radar Parameters, Limitations to MTI Performance, MTI versus Pulse Doppler Radar
Week 8	**Tracking Radar:** Tracking with Radar, Sequential Lobing, Conical Scan, Monopulse Tracking Radar
Week 9	Amplitude Comparison Monopoles (one- and two- coordinates), Angular Accuracy, Tracking in Range, Acquisition and Scanning Patterns, Comparison of Trackers.
Week 10	**Detection of Radar Signals in Noise:** Introduction, Matched Filter Receiver

Week 11	- Response Characteristics and Derivation, ,
Week 12	Correlation Function and Cross-correlation Receiver
Week 13	Efficiency of Non-matched Filters,.
Week 14	Matched Filter with Non-white Noise
Week 15	Preparing for Final Exam
Week 16	**Final Exam**

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	. Introduction to Radar Systems – Merrill I. Skolnik, TMH Special Indian Edition, 2nd Edition, Tata McGraw-Hill, 2007.	Yes
Recommended Texts	1. Introduction to Radar Systems – Merrill I. Skolnik, 3rd Edition Tata McGraw-Hill, 2001. 2. Radar: Principles, Technology, Applications-Byron Edde, Pearson Education, 2004. 3. Principles of Modern Radar: Basic Principles-Mark A. Richards, James A. Scheer, William A. Holm, Yesdee,2013. 4. 'Radar Hand Book ' Ed. By M.I Skolnik, 2nd Edition, Tata McGraw Hill. 5. 'Understanding Radar Systems' by Simon Kinsley and Shaun Quegan, Scitech Publishing, McGraw-Hill.	No
Websites	https://msi.nga.mil/api/publications/download?key=16694476/SFH00000/310ch1.pdf	

APPENDIX:

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	مقبول بقرار	(45-49)	More work required but credit awarded
	F - Fail	راسب	(0-44)	Considerable amount of work required

Note:

NB 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.

Ministry of Higher Education and Scientific Research - Iraq

University of Tikrit

College of Engineering

Department of Electrical Engineering

MODULE DESCRIPTOR

وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**RENEWABLE ENERGY**			**Module Delivery**	
Module Type	**ELECTIVE**			☒ Theory ☐ Lecture ☐ Lab ☒ Tutorial ☐ Practical ☐ Seminar	
Module Code	**TUSHEE4104**				
ECTS Credits	**4**				
SWL (hr./sem.)	**100**				
Module Level	4		**Semester (s) offered**	7	
Administering Department	**Electrical Engineering**		**College**	**Engineering- Shirqat**	
Module Leader			**e-mail**		
Module Leader's Acad. Title			**Module Leader's Qualification**		
Module Tutor			**e-mail**		
Peer Reviewer Name	Ayad Atiyah Abdulkafi		**e-mail**	ayad_atiyah@tu.edu.iq	
Review Committee Approval	01/06/2023		**Version Number**	1.0	

Relation With Other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	TUSHEE3100	**Semester**	1
Co-requisites module	None	**Semester**	-

Module Aims, Learning Outcomes, Indicative Contents and Brief Description

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية مع وصف مختصر

Module Aims أهداف المادة الدراسية	8- To understand the importance of renewable energy resources and its utilization for thermal and electrical energy needs and also the environmental aspects of these resources. 9- Understand the various forms of conventional energy resources. 10- Learn the present energy scenario and the need for energy conservation. 11- Explain the concept of various forms of renewable energy. 12- Outline division aspects and utilization of renewable energy sources for both domestics and industrial application 13- Analyze the environmental aspects of renewable energy resources. 14- Analysis the environmental conditions effects on the output power of the solar system.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	**LO19.** Understanding the foundation of fundamental of Energy Sources and Environmental Effects **LO20.** Describe the environmental aspects of non-conventional energy resources. In Comparison with various conventional energy systems, their prospects and limitations. **LO21.** Know the need of renewable energy resources, historical and latest developments. **LO22.** escribe the use of solar energy and the various components used in the energy production with respect to applications like - heating, cooling, desalination, power generation, drying, cooking etc. **LO23.** Appreciate the need of Wind Energy and the various components used in energy generation and know the classifications. **LO24.** Understand the concept of Biomass energy resources and their classification, types of biogas Plants- applications. **LO25.** Compare Solar, Wind and bio energy systems, their prospects, Advantages and limitations. **LO26.** Acquire the knowledge of fuel cells, wave power, tidal power and geothermal principles and applications.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following topic each has 5 Hrs including class lectures and tutorials. 13- Energy Sources and Environmental Effects 14- Electrical Fundamentals 15- Solar Photovoltaics 16- Detailed design project using commercial design methods and tools. 17- Applied Renewable Energy for Businesses & Residences 18- Charge Controllers and Inverters 19- Wind Power Fundamentals 20- Biomass Technologies 21- Geothermal Power Generation 22- Hydropower and Fuel Cells. 23- Second class project based on technology to be selected. 24- Generators and Connecting to The Grid
Course Description	This course will focus on the practical application of renewable energy technologies. Topics include energy and resource conservation and project siting, economics, financing, renewable energy and tax credits, technical and engineering aspects, regulatory issues, energy storage, monitoring and verification. Students study the advantages, limitations, and potential of various energy sources. Wind, solar, small-scale hydro, ground-source heat

	pumps, combined heat and power, biofuels, fuel cells, and other technologies are examined. Students will learn the strategies and cost/benefit analyses employed by energy analysts to meet demand with clean energy production. Students will also complete their own study and proposal for a renewable energy project.

Learning and Teaching Strategies

استراتيجيات التعلم والتعليم

Strategies	The learning and teaching strategy includes Class Participation, Homework Assignments, Project Presentation(s) and Quizzes/Tests

Student Workload (SWL)

الحمل الدراسي للطالب

Structured SWL (h/sem.) الحمل الدراسي المنتظم للطالب خلال الفصل	63	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4.2
Unstructured SWL (h/sem.) الحمل الدراسي غير المنتظم للطالب خلال الفصل	37	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	2.4
Total SWL (h/sem.) الحمل الدراسي الكلي للطالب خلال الفصل	100		

Module Evaluation

تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	4	20 % (20)	3, 6, 9, 12	All LO
	Assignments	4	10% (10)	Continuous	All LO
	Report	5	10% (10)	Continuous	All LO
Summative assessment	**Midterm Exam**	2 hr	10% (10)	8	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	Energy Sources and Environmental Effects
Week 2	Electrical Fundamentals
Week 3	Solar Photovoltaics
Week 4	Solar Power Systems – Electrical
Week 5	Solar Power Systems – Thermal and Mechanical
Week 6	Solar Tracking
Week 7	Detailed design project using commercial design methods and tools
Week 8	Midterm exam
Week 9	Charge Controllers and Inverters
Week 10	Study and analysis the maximum power point tracking charge controller.
Week 11	Biomass Technologies and Geothermal Power Generation
Week 12	Hybrid solar system.
Week 13	Second class project based on technology to be selected
Week 14	Generators and Connecting to The Grid
Week 15	The Big Picture, Putting It All Together
Week 16	Final exam

Learning and Teaching Resources

مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Renewable Energy Systems, David Buchla, Thomas Kissell and Thomas, Floyd, Pearson, 2015, ISBN: 978-0-13-262251-6.	Yes
Recommended Texts	Integration of Renewable Sources of Energy, 2nd Edition, Felix A Farret and M. Godoy Simoes, Wiley, 2018, ISBN: 978-1-11-913737-5,	Yes
Websites	https://greencleanguide.com/	

APPENDIX:

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	مقبول بقرار	(45-49)	More work required but credit awarded
	F - Fail	راسب	(0-44)	Considerable amount of work required

Note:

NB 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.

	Ministry of Higher Education and Scientific Research - Iraq University of Tikrit College of Engineering Department of Electrical Engineering	

MODULE DESCRIPTOR

وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**DIGITAL IMAGE PROCESSING**			**Module Delivery**	
Module Type	**ELECTIVE**			☒ Theory ☐ Lecture ☐ Lab ☒ Tutorial ☐ Practical ☐ Seminar	
Module Code	**TUSHEE4105**				
ECTS Credits	**4**				
SWL (hr./sem.)	**100**				
Module Level	4		**Semester (s) offered**	7	
Administering Department	**Electrical Engineering**		**College**	**Engineering- Shirqat**	
Module Leader	**Asst Prof Dr. Khamees Kh. Hasan**		**e-mail**	kaljomaily@tu.edu.iq	
Module Leader's Acad. Title	**Assistant Professor**		**Module Leader's Qualification**	**PhD**	
Module Tutor	**Asst Prof Dr. Khamees Kh. Hasan**		**e-mail**	kaljomaily@tu.edu.iq	
Peer Reviewer Name	Ayad Atiyah Abdulkafi		**e-mail**	ayad_atiyah@tu.edu.iq	

Review Committee Approval	01/06/2023	**Version Number**	1.0

Relation With Other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	TUSHEE2200	**Semester**	4
Co-requisites module	None	**Semester**	-

Module Aims, Learning Outcomes, Indicative Contents and Brief Description أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية مع وصف مختصر	
Module Aims أهداف المادة الدراسية	In this course, students learn all the fundamentals in 2-D digital image processing with emphasis in image processing techniques, image filtering design and applications.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	**LO27.** Develop a theoretical foundation of fundamental Digital Image Processing concepts. **LO28.** Provide mathematical foundations for digital manipulation of images; image acquisition; preprocessing; segmentation; Fourier domain processing; and compression. **LO29.** Gain experience and practical techniques to write programs using MATLAB language for digital manipulation of images; image acquisition; preprocessing; segmentation; Fourier domain processing; and compression. **LO30.** Knowledge and experience on Image Enhancement Using Arithmetic and Logic operations. **LO31.** Develop a theoretical foundation of Image Enhancement in the Spatial Domain **LO32.** Develop a theoretical foundation of Image Enhancement in the Frequency l Domain **LO33.** Develop a theoretical foundation of Image restoration compression and segmentation.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. • **Introduction and Digital Image Fundamentals:** (12 Hrs). ❖ The origins of Digital Image Processing ❖ Examples of Fields that Use Digital Image Processing • **Introduction and Digital Image Fundamentals: (cont.)** (12 Hrs). ❖ Fundamentals Steps in Image Processing ❖ Reading, Displaying, Writing Images ❖ Data Classes, Image Types • **Digital image Representation** (12 Hrs).

	❖ Converting Between data classes and Image Types ❖ Some basic relationships like Neighbors, Connectivity, Distance Measures between pixels ❖ Translation, Scaling, Rotation and Perspective Projection of image **Image Enhancement in the Spatial Domain** (12 Hrs). ❖ Some basic Gray Level Transformations ❖ Histogram Processing ❖ Enhancement Using Arithmetic and Logic operations ❖ Combining Spatial Enhancement Methods Basics of Spatial Filters • **Image Enhancement in the Frequency Domain:** (12 Hrs). ❖ Introduction to Fourier Transform and the frequency Domain ❖ Computing and Visualizing the 2D DFT ❖ Smoothing Frequency Domain Filters ❖ Sharpening Frequency Domain Filters
Course Description	This course also aims to: Have a clear understanding of the principals the Digital Image Processing terminology used to describe features of images. Have a good understanding of the mathematical foundations for digital manipulation of images; image acquisition; preprocessing; segmentation; Fourier domain processing, compression and analysis. Be able to write programs using Matlab language for digital manipulation of images; image acquisition; preprocessing; segmentation; Fourier domain processing; and compression. Have knowledge of the Digital Image Processing Systems. Be able to understand the documentation for, and make use of, the MATLAB library and Digital Image Processing Toolbox (IPT). Learn and understand the Image Enhancement in the Spatial Domain. Learn and understand the Image Enhancement in the Frequency Domain. Understand the Image Restoration, Compression, Segmentation, Recognition, Representation and Description.
Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The learning and teaching **strategy** is aimed to: Be able to use different digital image processing algorithms. Be able to design, code and test digital image processing applications. Be able to use the documentation for, and make use of, MATLAB library and Digital Image Processing Toolbox (IPT). Analyze a wide range of problems and provide solutions related to the design of image processing systems through suitable algorithms, structures, diagrams, and other appropriate methods. Practice self-learning by using the e-courses and web materials.

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem.) الحمل الدراسي المنتظم للطالب خلال الفصل	63	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4.2

Unstructured SWL (h/sem.) الحمل الدراسي غير المنتظم للطالب خلال الفصل	37	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	2.4
Total SWL (h/sem.) الحمل الدراسي الكلي للطالب خلال الفصل	100		

Module Evaluation

تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	4	20 % (20)	3, 6, 9, 12	All LO
	Assignments	4	10% (10)	Continuous	All LO
	Report	5	10% (10)	Continuous	All LO
Summative assessment	**Midterm Exam**	2 hr	10% (10)	8	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 And Digital Image Fundamentals
Week 2	Introduction And Digital Image Fundamentals (cont.)
Week 3	Digital image Representation
Week 4	Image Enhancement in the Spatial Domain

Week 5	Image Enhancement in the Spatial Domain (cont.)
Week 6	Image Enhancement in the Frequency Domain
Week 7	Image Enhancement in the Frequency Domain (cont.)
Week 8	Midterm exam
Week 9	Image Restoration
Week 10	Image Restoration (cont.)
Week 11	Image Compression
Week 12	Image Compression (cont.)
Week 13	Image Segmentation
Week 14	Image Segmentation (cont.)
Week 15	Matlab on Image processing
Week 16	Final exam

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	**1-** "Digital Image Processing". Author(s)/Editor(s): R. C. Gonzalez and R. E. Woods. Publisher: Pearson-Prentice-Hall, 2008 ISBN: 0-13-168728-x, 978-0-13-168728-8 Edition: third	Yes

Recommended Texts	**2 "DIGITAL IMAGE PROCESSING USING MATLAB".** **AUTHOR(S)/EDITOR(S): R. C. GONZALEZ, R. E. WOODS, S. L. EDDINS.** **PUBLISHER: PEARSON-PRENTICE-HALL, 2004** **ISBN: 0-13-008519-7** **Edition: 2nd.**	Yes
Websites	www.imageprocessingplace.com (required). Text book website) www.mathworks.com (MATLAB documentation) en.wikipedia.org/wiki/Digital image processing (General image processing concepts) www.mathworks.com/access/helpdesk/help/pdf_doc/matlab/getstart.pdf (MATLAB Getting Started Guide from Mathworks)	

APPENDIX:

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	مقبول بقرار	(45-49)	More work required but credit awarded
	F - Fail	راسب	(0-44)	Considerable amount of work required
Note:				

	Ministry of Higher Education and Scientific Research - Iraq University of Tikrit College of Engineering-Shirqat Departments of Engineering collage	

MODULE DESCRIPTOR

وصف المادة الدراسية

Module Information معلومات المادة الدراسية				
Module Title	**FIBER OPTIC COMMUNICATION SYSTEM**		**Module Delivery**	
Module Type	**ELECTIVE**		☒ Theory ☐ Tutorial	
Module Code	**TUSHEE4205**			
ECTS Credits	**6**			
SWL (hr/sem)	**150**			
Module Level	**4**	**Semester (s) offered**	**8**	
Administering Department	**Electrical**	**College**	**Engineering- Shirqat**	
Module Leader	**Sura Hamad FARAJ**	**e-mail**	Sura.faraj@tu.edu.iq	
Module Leader's Acad. Title	**Assistant lecture**	**Module Leader's Qualification**	**MSc**	
Module Tutor	**Sura Hamad FARAJ**	**e-mail**	Sura.faraj@tu.edu.iq	
Peer Reviewer Name	**Ayad Atiyah Abdulkafi**	**e-mail**	ayad_atiyah@tu.edu.iq	

Review Committee Approval	01/06/2023	**Version Number**	1.0

Relation With Other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	TUSHEE3102	**Semester**	5
Co-requisites module	None	**Semester**	-
Module Aims, Learning Outcomes, Indicative Contents and Brief Description أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية مع وصف مختصر			
Module Aims أهداف المادة الدراسية	1. Understand the function and performance of the optical fiber communication system 2. Understand the properties of optical fiber 3. Understand transmitters and receivers of light 4. Identify the problems faced by the prescribed system 5. Explanation of methods that compensate for losses resulting from transmission 6. Understand basic concepts of optical amplification. 7. Identify the types of optical amplifiers and Principle of Operation.		
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	**On successful completion of the course students will be able to:** **LO10.** Defining the needs of fiber optic communication systems **LO11.** Understand transmitters and receivers of light. **LO12.** Clarify the purpose of applying the optical communications system **LO13.** Selection of the basic components of the fiber optic, Single mode and multimode wave. **LO14.** Describe the losses resulting from transmission the optical signal (dispersion, attenuation and non-linear effects). **LO15.** Learn about DCF and Fiber Bragg Grating (FBG). **LO16.** Understand the optical amplification by using appropriate optical amplifiers in terms of wavelength and Pumping Requirements **LO17.** Detailed study of optical amplifiers and the types selected in this course (EDFA and Raman amplifier). **LO18.** Explanation of the basic parameters of amplification (Gain Spectrum, Gain saturation, bandwidth, and noise figure). **LO19.** Study the WDM light wave system.		

Indicative Contents المحتويات الإرشادية	Indicative contents include the following. **fiber-optic-communication-system (45 Hours)** 1. fiber-optic-communication-system Introduction and basic concepts (4 hours) 2. transmitters and receivers of light (4 hours) 3. the basic components of the fiber optic, Single mode and multimode wave (4 hours). 4. The problems faced by the prescribed system and methods that compensate for losses resulting from transmission (6 hours). 5. Scattering effects and Kerr effects (4 hours). 6. DCF and Fiber Bragg Grating (FBG) (4 hours). 7. The optical amplification (4 hours). 8. Erbium-Doped Fiber Amplifiers (4 hours). 9. Raman amplifier (4 hours). 10. Gain Spectrum, Gain saturation, bandwidth, and noise figure (3 hours). 11. WDM light wave system (4 hours).
Course Description	This course gives an introduction of the principles and technologies of optical fiber communications and optical networks. It covers optical fiber waveguide theory, the structure and performance of active and passive optical devices, WDM technology, optical fiber communication systems, and the structures and key technologies of optical fiber information networks. The new technologies and developing trends of optical fiber communications.
Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The teaching of the course is delivered through a combination of lectures, online lectures.

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem)	48	**Structured SWL (h/w)**	3.2

الحمل الدراسي المنتظم للطالب خلال الفصل		الحمل الدراسي المنتظم للطالب أسبوعيا	
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	102	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	6.8
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	150		

Module Evaluation

تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	4	30 % (30)	3, 6, 9, 12	All LO
	Assignments	4	10% (10)	Continuous	All LO
	Lab.				
	Report				
Summative assessment	Midterm Exam	2 hr	10% (10)	7	LO # 1-5
	Final Exam	3 hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	fiber-optic-communication-system Introduction and basic concepts.
Week 2	transmitters and receivers of light
Week 3	the basic components of the fiber optic, Single mode and multimode wave
Week 4	Dispersion
Week 5	attenuation
Week 6	non-linear effects ,
Week 7	DCF and Fiber Bragg Grating (FBG)
Week 8	Midterm Exam
Week 9	The optical amplification: Erbium-Doped Fiber Amplifiers
Week 10	Pumping Requirements
Week 11	Raman amplifier
Week 12	Saturation in Raman Fiber Amplifier
Week 13	Gain Spectrum, Gain saturation, bandwidth, and noise figure
Week 14	WDM light wave system
Week 15	preparing for final exam.
Week 16	**Final Exam**

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

Required Texts	Fiber-Optic Communication Systems, 3rd Edition, by Govind P. Agrawal (Wiley).	Yes
Recommended Texts	Understanding Optical Communications Harry J. R. Dutton. First Edition (September 1998)	No
Websites	https://gctjaipur.files.wordpress.com/2015/08/fiber-optic-communication-systems.pdf	

APPENDIX:

GRADING SCHEME مخطط الدرجات				
Group	**Grade**	التقدير	**Marks (%)**	**Definition**
Success Group (50 - 100)	**A** - Excellent	امتياز	90 - 100	Outstanding Performance
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	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
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Fail Group (0 - 49)	**FX** - Fail	مقبول بقرار	(45-49)	More work required but credit awarded
	F - Fail	راسب	(0-44)	Considerable amount of work required

Note:

NB 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.

	Ministry of Higher Education and Scientific Research - Iraq University of Tikrit College of Engineering-Shirqat Departments of Engineering collage	

MODULE DESCRIPTOR

وصف المادة الدراسية

Module Information معلومات المادة الدراسية				
Module Title	Nanotechnology		**Module Delivery**	
Module Type	ELECTIVE		☒ Theory ☐ Lecture ☐ Lab ☐Tutorial ☐ Practical ☐ Seminar	
Module Code	TUSHEE4206			
ECTS Credits	6			
SWL (hr/sem)	150			
Module Level	4	**Semester (s) offered**		8
Administering Department	Electrical	**College**	Engineering- Shirqat	
Module Leader	Abdulqader Ali Hasan	**e-mail**	abdulkader.ali@tu.edu.iq	
Module Leader's Acad. Title	Assistant Teacher	**Module Leader's Qualification**		MSc
Module Tutor	Abdulqader Ali Hasan	**e-mail**	abdulkader.ali@tu.edu.iq	
Peer Reviewer Name		**e-mail**		

Review Committee Approval	01/06/2023	**Version Number**	1.0

Relation With Other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None	**Semester**	-
Co-requisites module	None	**Semester**	-
Module Aims, Learning Outcomes, Indicative Contents and Brief Description أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية مع وصف مختصر			
Module Aims أهداف المادة الدراسية	17. To foundational knowledge of the Nanotechnology and related fields. 18. 2.To make the students acquire an understanding the Nanoscience and Applications. 19. 3. To help them understand in broad outline of Nanoscience and Nanotechnology. 20. To Understanding the synthesis of nanomaterials and their application and the impact of nanomaterials on environment. 21. To Explain the history of nanotechnology, identify current nanotechnology solutions in design, engineering, and manufacturing.		
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	On successful completion of the course students will be able to: **LO33.** Describe developments in Nanotechnology and it is going to affect our future life. **LO34.** Describe materials and their properties at the atomic and nanometer level and the intimate relationship between material scale (nanostructure) and the properties/functionality of materials. **LO35.** Describe nanomaterials based on their dimensionality. **LO36.** Describe the increase in surface to volume ration with reducing size. **LO37.** Explain the importance of the reduction in dimensionality, and its relationship to materials properties. **LO38.** Describe solution and vapor growth techniques of 1D-2D nanostructures. **LO39.** Describe fundamentals of nucleation growth. **LO40.** Describe self-assembly, surfaces and interfaces in nanotechnology. **LO41.** Give examples on size-dependent phenomena. **LO42.** Explain top-down and bottom-up approaches for Nanomaterial fabrication. **LO43.** Describe and discuss Nanotechnology tools. **LO44.** Describe societal impacts and ethics in Nanotechnology. **LO45.** Explain underlying principles in products using nanotechnology.		

	LO46. Systematically solve scientific problems related specifically to nanomaterials using conventional scientific and mathematical notations.
Indicative Contents المحتويات الإرشادية	Indicative contents include the following. **Part A: Introduction to Nanotechnology and Nanomaterials Properties. (25 Hours)** 39. Introduction to Nanotechnology. What is Nano? What is nanotechnology?, Examples of Natural Nanotechnologists. (4 hrs). 40. Classification of nanostructures by dimensionality- 0D, 1D, 2D& 3DNanostructures, Surface Area to Volume Ratio in Nanomaterials, Size Dependent Properties. (4 hrs). 41. Properties of Nanomaterials, Electrical Properties, Optical Properties,-Magnetic Properties, Thermal properties.(4hrs) 42. Mechanical properties(Hardness and strength, Tensile ductility and Toughness &Creep) ,Corrosion properties, Biological properties. (4hrs) 43. Synthesis Routes of Nano-Structured Materials, Bottom – Up Approach, Top - Down Approach Types of Engineered Nanomaterials- Nano Composites- Ceramic and glassy nanomaterials.(4 hrs) 44. Carbon based materials, Carbon nanotubes (Types of carbon nanotubes, Structure of carbon nanotubes, Properties of carbon nanotubes, Mechanical properties, Electrical and thermal properties, Chemical reactivity, Synthesis of CNT, Carbon Nanotubes applications). (5 hrs) **Part B: Investigating the Nanoscale and Applications of Nanotechnology .(20hours)** 45. Advanced sintering process type (Microwave sintering, Spark plasma sintering), Techniques for characterization of nanoparticles, Scanning Electron Microscopy (SEM), Transmission Electron Microscopy (TEM). (6 hrs) 46. Scanning tunneling microscope (STM),Atomic force microscope (AFM), X-ray diffraction (XRD),Energy dispersive X-ray analysis (EDAX). (6 hrs) 47. Applications of Nanotechnology, Renewable energy, solar energy, fuel cells etc., Materials manufacturing and automobile industry, Biomedical science, medicine, diagnostics, etc., Computers, electronics and communication , Health and Medicine. (5 hrs) 48. Health risks, Safety of nanomaterials. (3 hrs)
Course Description	The course aims at introducing students to the nanotechnology as a new emerging field spanning specifically on physics and generally on the other branches of science and also Introducing tools and principles relevant at the nanoscale dimension. Discusses current and future nanotechnology applications in engineering, materials, physics, chemistry, biology, electronics, and energy. The objective tasks are performed through discussing the concepts of nanotechnology, the scale of nanotechnology and its imaging towards the fabrication of nanoworld and nanostructures. Additionally, the course describes geometry of nanoscales, the physical properties of nanostructures and their application in fabricating nanodevices .

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The teaching of the course is delivered through a combination of lectures, online lectures and exercises.

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	48	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	3.2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	102	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	6.8
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	150		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	4	30 % (30)	3, 6, 9, 12	All LO
	Assignments	4	10% (10)	Continuous	All LO
	Lab.				
	Report				

Summative assessment	**Midterm Exam**	2 hr	10% (10)	7	LO # 1-6
	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 Nanotechnology. What is Nano? What is nanotechnology?, Examples of Natural Nanotechnologists.
Week 2	Classification of nanostructures by dimensionality- 0D, 1D, 2D& 3DNanostructures.
Week 3	Surface Area to Volume Ratio in Nanomaterials, Size Dependent Properties.
Week 4	Properties of Nanomaterials, Electrical Properties, Optical Properties,-Magnetic Properties, Thermal properties.
Week 5	Mechanical properties(Hardness and strength, Tensile ductility and Toughness & Creep),Corrosion properties, Biological properties.
Week 6	Synthesis Routes of Nano-Structured Materials, Bottom – Up Approach, Top - Down Approach Types of Engineered Nanomaterials- Nano Composites- Ceramic and glassy nanomaterials .
Week 7	Carbon based materials, Carbon nanotubes (Types of carbon nanotubes, Structure of carbon nanotubes.
Week 8	Properties of carbon nanotubes, Mechanical properties, Electrical and thermal properties, Chemical reactivity, Synthesis of CNT, Carbon Nanotubes applications).
Week 9	Advanced sintering process type (Microwave sintering, Spark plasma sintering).
Week 10	Techniques for characterization of nanoparticles, Scanning Electron Microscopy (SEM), Transmission Electron Microscopy (TEM).
Week 11	Scanning tunneling microscope (STM),Atomic force microscope (AFM).
Week 12	X-ray diffraction (XRD),Energy dispersive X-ray analysis (EDAX).
Week 13	Applications of Nanotechnology, Renewable energy, solar energy, fuel cells etc.,Materials manufacturing and automobile industry, Biomedical science, medicine, diagnostics, etc., Computers, electronics and communication , Health and Medicine.
Week 14	Health risks, Safety of nanomaterials
Week 15	Preparing for Final Exam
Week 16	**Final Exam**

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	1-Nanotechnology. M. Ko¨hler and W. Fritzsche Copyright [a] 2007 WILEY-VCH Verlag GmbH & Co. KGaA, Weinheim.	No
Recommended Texts	Materials Scienceand Engineering,An Introduction. WILLIAM D. CALLISTER, JR.DAVID G.RETHWISCH.	No
Websites	https://cae.tu.edu.iq/ed/electronic-lectures.html	

APPENDIX:

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	مقبول بقرار	(45-49)	More work required but credit awarded
	F - Fail	راسب	(0-44)	Considerable amount of work required
Note:				