



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	Calculus I		Module Delivery
Module Type	Basic		Theory Lecture Tutorial Seminar
Module Code	MATH-101		
ECTS Credits	5		
SWL (hr/sem)	125		
Module Level	1	Semester (s) offered	
Administering Department	Electrical Engineer- ing	College	Engineering
Module Leader	Assist.Prof. Shahir F. Nawaf	e-mail	shahi6@tu.edu.iq
Module Leader's Acad. Title	Assist.Prof.	Module Leader's Qualification	Msc
Module Tutor	Shahir F. Nawaf	e-mail	shahi6@tu.edu.iq
Peer Reviewer Name		e-mail	
Review Committee Approval	01/06/2023	Version Number	

## Relation With Other Modules

### العلاقة مع المواد الدراسية الأخرى

Prerequisite module	Calculus I	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

<b>Module Aims</b> أهداف المادة الدراسية	1- Enable students to solve equations both algebraically and graphically 2- Enable students to solve and analyze engineering problems. 3- Solving engineering problems choosing the most suitable method using a correct mathematical basis. 4- To develop logical understanding of the subject. 5- Enriching the student's thinking with many engineering mathematical concepts. 6- To develop mathematical skill so that students are able to apply mathematical methods & principals in solving problem from Engineering fields.
<b>Module Learning Outcomes</b> مخرجات التعلم للمادة الدراسية	1- Ability to identify, formulates, and solves engineering problems. 2- Represent functions using power series 3- Evaluate the behaviors and graphs of functions 4- Apply integrals to geometric application, physical application, and modeling problems 5- Apply integration to the calculation of areas ,volumes, areas of the surfaces.
<b>Indicative Contents</b> المحتويات الإرشادية	Indicative content includes the following. <ul style="list-style-type: none"> <li>• Transcendental Functions (14 hrs)</li> <li>• Methods of Integration (20hrs)</li> <li>• Hyperbolic Function (14hrs)</li> <li>• Power Series(12hrs)</li> </ul>
<b>Course Description</b>	This course aims to establish fundamental knowledge of This subject covers techniques of integration, exponential and logarithmic functions , Hyperbolic Function and Taylor's Series

## Learning and Teaching Strategies

### استراتيجيات التعلم والتعليم

<b>Strategies</b>	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 In class lectures                      50 In class tests                                5 Seminars                                        4	73	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعياً	<b>4.86</b>
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل Library, dorm, home memorizing        36 Preparation for tests                        20 Homeworks                                    10	52	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعياً	<b>3.46</b>
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	125		

### Module Evaluation تقييم المادة الدراسية

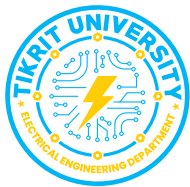
		Time (hr)	Weight (Marks)	Week Due	Relevant Learning Outcome
<b>Formative assessment</b>	Quizzes	2	18% (18)	5, 10, 12, 14	LO #1, 2, 3, and 4
	Assignments	6	12% (12)	2, 4, 6, 8	LO # 1, 2, 3, 4 and, 5
	Seminars	2	20% (20)	7	LO # 1-5
<b>Summative assessment</b>	Midterm Exam	3	50% (50)	16	All
	Final Exam	2	18% (18)	5, 10, 12, 14	LO #1, 2, 3, and 4
<b>Total assessment</b>		100% (100 Marks)			

**Delivery Plan (Weekly Syllabus)**  
**المنهاج الاسبوعي النظري**

	<b>Material Covered</b>
<b>Week 1</b>	Transcendental Functions
<b>Week 2</b>	Transcendental Functions , cont'd
<b>Week 3</b>	Solved examples and problems
<b>Week 4</b>	Methods of Integration, By parts
<b>Week 5</b>	Methods of Integration, Products of Powers of Trigonometric functions
<b>Week 6</b>	Methods of Integration ,Even powers of Sine and Cosine
<b>Week 7</b>	Trigonometric substitutions that replace $a^2-u^2, a^2+u^2$ and $u^2-a^2$
<b>Week 8</b>	Midterm exam
<b>Week 9</b>	Hyperbolic Function , Derivatives and Integrals of Hyperbolic Function
<b>Week 10</b>	Inverse of Hyperbolic Function
<b>Week 11</b>	Solved examples and problems
<b>Week 12</b>	Power Series, Taylor Polynomials
<b>Week 13</b>	Taylor's Series for Sine, Cosine and $e^x$
<b>Week 14</b>	Binomial Theorem
<b>Week 15</b>	Solved examples and problems
<b>Week 16</b>	Final Exam

**Delivery Plan (Weekly Syllabus)**  
**المنهاج الاسبوعي النظري**

	<b>Text</b>	<b>Available in the Library?</b>
<b>Required Texts</b>	Calculus and analytical geometry , George B. Thomas Jr. ; Addison – Wesley publishing company ,7th edition ,1988.	YES
<b>Recommended Texts</b>	- Calculus; James Stewart ,10th edition, 2003.	YES
<b>Websites</b>		



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	calculus II		Module Delivery
Module Type	Basic		Theory Lecture Tutorial
Module Code	MATH-102		
ECTS Credits	5		
SWL (hr/sem)	125		
Module Level	1	Semester (s) offered	2
Min number of students	15	Max number of students	100
Administering Department	Electrical Engineering	College	Engineering
Module Leader	Shahir F. Nawaf	e-mail	Shahi61@tu.edu.iq
Module Leader's Acad. Title	Assist.Prof.	Module Leader's Qualification	Msc
Module Tutor	None	e-mail	None
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	MATH-101	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

<b>Module Aims</b> أهداف المادة الدراسية	1- Be able to calculate the tangent and normal vectors. 2- Be able to apply differential operators to scalar and vector fields. 3- Be able to determine the limit and continuity of a functions of two variables. 4- Be able to determine the domain, codomain, range of functions of two or more variables, to do algebraic operations between them and sketch their graphs. 5- Be able to evaluate the derivatives of functions of two or more variables. 6- Be able to solve simple real problems related to derivatives of functions of two or three variables. 7- Be able to solve problems related to integral of functions of two or three variables. 8- Be able to Understand that the modulus of a complex number is equal to the square root of the sum of the squares of the real and imaginary parts of the number.
<b>Module Learning Outcomes</b> مخرجات التعلم للمادة الدراسية	1- Understanding of the concepts of vectors in space and vector valued functions. 2- Ability to compute derivatives and integrals of vector-valued functions and solve related problems with various applications. Evaluate the behaviors and graphs of functions 3- Ability to compute multiple integrals and use them in various applications ability to compute multiple integrals and use them in various applications. 4- understanding of the concepts of calculus of multi-dimensional quantities and solve related problems with various applications. 5- Ability to identify, formulates, and solves engineering problems. 6- Understanding that the modulus of a complex number is equal to the square root of the sum of the squares of the real and imaginary parts of the number.
<b>Indicative Contents</b> المحتويات الإرشادية	Indicative content includes the following. <ul style="list-style-type: none"> <li>• Vectors (12 hrs)</li> <li>• Function of Two and more Variables and Their Derivatives (18hrs)</li> <li>• Multiple Integral (18hrs)</li> <li>• Complex Number (11hrs)</li> </ul>
<b>Course Description</b>	A continuation of Calculus I. This is a study of multivariable calculus including vector-valued functions and the calculus of curves in space, differential calculus of multivariate functions, integral calculus of multivariate functions, spherical and cylindrical coordinates, line and surface integrals.

## Learning and Teaching Strategies

### استراتيجيات التعلم والتعليم

<b>Strategies</b>	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 للطلاب

Structured SWL (h/sem) الحمل الدراسي المنتظم للطلاب خلال الفصل In class lectures 53 In class tests 6	73	Structured SWL (h/w) الحمل الدراسي المنتظم للطلاب أسبوعياً	4.86
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطلاب خلال الفصل dorm, home memorizing 38 Preparation for tests 18 Homeworks 10	52	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطلاب أسبوعياً	3.46
Total SWL (h/sem) الحمل الدراسي الكلي للطلاب خلال الفصل	125		

### Module Evaluation تقييم المادة الدراسية

		Time (hr)	Weight (Marks)	Week Due	Relevant Learning Outcome
<b>Formative assessment</b>	Quizzes	2	18% (18)	5, 10, 12, 14	LO #1, 2, 3, and 4
	Assignments	6	12% (12)	2, 4, 6, 7	LO # 1, 2, 3, 4 and, 5
<b>Summative assessment</b>	Midterm Exam	2	20% (20)	8	LO # 1-6
	Final Exam	3	50% (50)	16	All
<b>Total assessment</b>			100% (100 Marks)		

## Delivery Plan (Weekly Syllabus)

### المنهاج الاسبوعي النظري

	Material Covered
Week 1	Vectors , Vector in Space
Week 2	Dot and Cross Products on Vectors
Week 3	Equations for Lines and Planes in Space
Week 4	Function of Two and more Variables and Their Derivatives
Week 5	Partial Derivatives , Chain Rules
Week 6	Gradient and Directional Derivatives
Week 7	Applications of Partial of Derivative (maximum, minimum and saddle point)
Week 8	Midterm exam
Week 9	Double integral
Week 10	Double integral in polar coordinates
Week 11	Changing Cartesian integrals into Polar integrals
Week 12	Triple integral (Rectangular, Cylindrical and Spherical)
Week 13	Complex Number , Addition, Subtraction, Multiplication and Division
Week 14	Polar representation of Complex Number
Week 15	Complex Number
Week 16	Final Exam

## Delivery Plan (Weekly Syllabus)

### المنهاج الاسبوعي النظري

	Text	Available in the Library?
Required Texts	Calculus and analytical geometry , George B. Thomas Jr. ;Addison – Wesley publishing company ,7th edition ,1988.	YES
Recommended Texts	Calculus; James Stewart ,10th edition, 2003.	NO
Websites	N/A	





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	A.C. Electrical Circuits		Module Delivery
Module Type	Core		Theory Lecture Lab Tutorial Practical Seminar
Module Code	ELEC-121		
ECTS Credits	8		
SWL (hr/sem)	200		
Module Level	1	Semester (s) offered	2
Administering Department	Electrical Engineering	College	Engineering
Module Leader	Lujain Sabah Abdulla	e-mail	lujainsabah@tu.edu.iq
Module Leader's Acad. Title	Lecturer	Module Leader's Qualification	Msc.
Module Tutor	Lujain Sabah Abdulla	e-mail	lujainsabah@tu.edu.iq
Peer Reviewer Name	Name	e-mail	
Review Committee Approval	01/06/2023	Version Number	1.0

## Relation With Other Modules

### العلاقة مع المواد الدراسية الأخرى

<b>Prerequisite module</b>	ELEC-111	Semester	1
<b>Co-requisites module</b>	None	Semester	-

## Module Aims, Learning Outcomes, Indicative Contents and Brief Description

### أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية مع وصف مختصر

<b>Module Aims</b> أهداف المادة الدراسية	<ol style="list-style-type: none"> <li>1. To develop problem solving skills and understanding of circuit theory through the application of techniques.</li> <li>2. This course deals with the basic concept of A.C. electrical circuits.</li> <li>3. This is the basic subject for all A.C. electrical circuits.</li> <li>4. To understand Kirchoff's current and voltage Laws problems.</li> <li>5. To perform mesh and Nodal analysis in A.C. circuits.</li> <li>6. To understand superposition, Thivenen, Norton , Max power transfer and millman Theorems in A.C. circuits.</li> <li>7. To perform the complex power.</li> <li>8. To understand the resonance circuits.</li> <li>9. To understand the Magnetic circuit.</li> </ol>
<b>Module Learning Outcomes</b> مخرجات التعلم للمادة الدراسية	<ol style="list-style-type: none"> <li>1. Recognize how electricity works in electrical circuits.</li> <li>2. Summarize what is meant by a basic electric circuit in AC.</li> <li>3. Identify the basic circuit elements in A.C. circuits and their applications.</li> <li>4. Explain the two Kirchoff's laws used in A.C. circuit analysis.</li> <li>5. Explain mesh and Nodal analysis in A.C. circuits.</li> <li>6. Understand the independent and dependent sources.</li> <li>7. Explain superposition, Thivenen, Norton , Max power transfer and millman Theorems in A.C. circuits.</li> <li>8. Explain the complex power and power factor correction.</li> <li>9. Explain the resonance circuits.</li> <li>10. Explain the Magnetic circuits.</li> </ol>
<b>Indicative Contents</b> المحتويات الإرشادية	<p>Indicative content includes the following.</p> <ol style="list-style-type: none"> <li>1. Analysis of single phase ac circuits [18hrs]</li> <li>2. Complex number &amp; its application to ac circuit [40hrs]</li> <li>3. Resonance [12hrs]</li> <li>4. Magnetic circuit [18hrs]</li> </ol>

## Learning and Teaching Strategies

### استراتيجيات التعلم والتعليم

<b>Strategies</b>	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 للطلاب

Structured SWL (h/sem) الحمل الدراسي المنتظم للطلاب خلال الفصل	102	Structured SWL (h/w) الحمل الدراسي المنتظم للطلاب أسبوعياً	6.8
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطلاب خلال الفصل	98	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطلاب أسبوعياً	6.5
<b>Total SWL (h/sem) الحمل الدراسي الكلي للطلاب خلال الفصل</b>	<b>200</b>		



## Module Evaluation تقييم المادة الدراسية

		Time (hr)	Weight (Marks)	Week Due	Relevant Learning Outcome
<b>Formative assessment</b>	Quizzes	3	15% (10)	5, 10, 13	LO #1, 2, 5, 6, 7, and 9
	Assignments	4	8% (10)	3, 6, 11, 14	LO # 3, 4, 6, 8 and 9
	Lab.	1	12% (10)	Continuous	
	Report	1	5% (10)	13	LO # 5, 6, 7 and 8
<b>Summative assessment</b>	Midterm Exam	2hrs	10% (10)	7	LO # 1-6
	Final Exam	3hrs	50% (50)	16	All
<b>Total assessment</b>			100% (100 Marks)		

## Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري

	Material Covered
Week 1	HUMAN VALUES: Courage , Valuing time ,Cooperation ,Commitment,Empathy.
Week 2	Voltage and current relation in pure resistive – inductive and capacitive circuits.
Week 3	Reactance and impedance, Phasor diagram, Series circuits, parallel circuits.
Week 4	Series-parallel circuits, power calculation in a.c. circuits, power factor.
Week 5	Evaluation of impedance, KVL, KCL, Star-delta conversion.
Week 6	Mesh analysis, Nodal analysis.
Week 7	Dependent and independent sources, Superposition theorem.
Week 8	Thevenin's theorem, Norton's theorem.
Week 9	Mid-term Exam + Maximum power transfer.
Week 10	Millman's theorem, Substitution theorem, complex power.
Week 11	Power calculation, power factor correction.
Week 12	Series resonance, quality factor, selectivity, Half power, frequency and bandwidth.
Week 13	parallel resonance, quality factor, selectivity, Half power, frequency and bandwidth, Series-parallel resonance circuits.
Week 14	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.
Week 16	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.

## Delivery Plan (Weekly Lab. Syllabus)

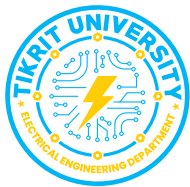
### المنهاج الاسبوعي للمختبر

	Material Covered
Week 1	Lab 1: Oscilloscope
Week 2	Lab 2: Phasor diagram
Week 3	Lab 3: RLC in AC circuits
Week 4	Lab 4: KVL and KCL in AC circuits
Week 5	Lab 5: Thevenin and max. power transfer in AC circuits
Week 6	Lab 6: Power calculation in AC circuits
Week 7	Lab 7: 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	N/A	



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	A.C. Electrical Circuits		Module Delivery
Module Type	Core		Theory Lecture Lab Tutorial Practical Seminar
Module Code	ELEC-111		
ECTS Credits	8		
SWL (hr/sem)	200		
Module Level	1	Semester (s) offered	1
Administering Department	Electrical Engineering	College	Engineering
Module Leader	Lujain Sabah Abdulla	e-mail	lujainsabah@tu.edu.iq
Module Leader's Acad. Title	Lecturer	Module Leader's Qualification	Msc.
Module Tutor	Lujain Sabah Abdulla	e-mail	lujainsabah@tu.edu.iq
Peer Reviewer Name	Name	e-mail	
Review Committee Approval	01/06/2023	Version Number	1.0

## Relation With Other Modules

### العلاقة مع المواد الدراسية الأخرى

<b>Prerequisite module</b>	None	Semester	-
<b>Co-requisites module</b>	None	Semester	-

## Module Aims, Learning Outcomes, Indicative Contents and Brief Description

### أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية مع وصف مختصر

<b>Module Aims</b> أهداف المادة الدراسية	<ol style="list-style-type: none"> <li>1. To develop problem solving skills and understanding of circuit theory through the application of techniques.</li> <li>2. To understand voltage, current and power from a given circuit.</li> <li>3. This course deals with the basic concept of D.C. electrical circuits.</li> <li>4. This is the basic subject for all D.C. electrical circuits.</li> <li>5. To understand Kirchhoff's current and voltage Laws problems.</li> <li>6. To perform mesh and Nodal analysis.</li> <li>7. To understand superposition, Thivenen, Norton , Max power transfer and millman Theorems in D.C. circuits.</li> <li>8. To perform the basic circuit elements.</li> <li>9. To understand the operations of sinusoid and phasors in an electric circuit.</li> </ol>
<b>Module Learning Outcomes</b> مخرجات التعلم للمادة الدراسية	<ol style="list-style-type: none"> <li>1. Recognize how electricity works in electrical circuits.</li> <li>2. List the various terms associated with electrical circuits.</li> <li>3. Summarize what is meant by a basic electric circuit.</li> <li>4. Discuss the reaction and involvement of atoms in electric circuits.</li> <li>5. Describe electrical power, charge, and current.</li> <li>6. Define Ohm's law.</li> <li>7. Identify the basic circuit elements and their applications.</li> <li>8. Explain the two Kirchoff's laws used in D.C. circuit analysis.</li> <li>9. Explain mesh and Nodal analysis in D.C. circuits.</li> <li>10. Explain superposition, Thivenen, Norton , Max power transfer and millman Theorems in D.C. circuits.</li> <li>11. Identify the basic circuit elements and their applications.</li> <li>12. Discuss the operations of sinusoid and phasors in an electric circuit.</li> </ol>
<b>Indicative Contents</b> المحتويات الإرشادية	<p>Indicative content includes the following.</p> <ol style="list-style-type: none"> <li>1. Basic concept and units [16hrs]</li> <li>2. Analysis of dc circuits [40hrs]</li> <li>3. Capacitance and Inductors in D.C. Circuits [16hrs]</li> <li>4. Alternation quantities [16hrs]</li> </ol>

## Learning and Teaching Strategies

### استراتيجيات التعلم والتعليم

<b>Strategies</b>	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 للطلاب

Structured SWL (h/sem) الحمل الدراسي المنتظم للطلاب خلال الفصل	102	Structured SWL (h/w) الحمل الدراسي المنتظم للطلاب أسبوعياً	6.8
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطلاب خلال الفصل	98	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطلاب أسبوعياً	6.5
Total SWL (h/sem) الحمل الدراسي الكلي للطلاب خلال الفصل	200		



## Module Evaluation

### تقييم المادة الدراسية

		Time (hr)	Weight (Marks)	Week Due	Relevant Learning Outcome
<b>Formative assessment</b>	Quizzes	3	15% (10)	5, 10, 13	LO #1, 2, 6, 8, 9 and 10
	Assignments	4	8% (8)	3,6, 11,14	LO # 3, 4, 6, 8, 9, 10 and 11
	Lab.	1	12% (10)	Continuous	
	Report	1	5% (10)	13	LO # 5, 8 and 10
<b>Summative assessment</b>	Midterm Exam	2hrs	10% (10)	7	LO # 1-7
	Final Exam	3hrs	50% (50)	16	All
<b>Total assessment</b>			100% (100 Marks)		

## Delivery Plan (Weekly Syllabus)

### المنهاج الاسبوعي النظري

	Material Covered
<b>Week 1</b>	HUMAN VALUES:- Morals, values and Ethics – Integrity – Work ethic – Service learning – Civic virtue.
<b>Week 2</b>	Electricity & atomic structure of substance, current and current density current flow.
<b>Week 3</b>	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.
<b>Week 4</b>	Electric units, efficiency and percentage efficiency, Ohm's law, resistivity & conductivity, temperature effect.
<b>Week 5</b>	Internal resistance of a source, open circuit & short circuit, Series circuits, KVL.
<b>Week 6</b>	Parallel circuits, KCL, Series-parallel circuits.
<b>Week 7</b>	Source conversion, determinants, Mesh analysis method.
<b>Week 8</b>	Nodal analysis, Bridge network, star – delta conversion.
<b>Week 9</b>	Mid-term Exam + Superposition theorem.
<b>Week 10</b>	Thevenin's theorem, Norton's theorem.
<b>Week 11</b>	Maximum power transfer, Millman's theorem, Substitution theorem.
<b>Week 12</b>	Capacitance, charging phase, discharging phase, capacitor in series and parallel, energy stored by capacitor.
<b>Week 13</b>	Self-inductance, R-L: storage cycle and decay phase, Inductors in series and parallel, energy stored by an inductor.
<b>Week 14</b>	Magnetic field, fields due to electrical current, Generation of single phase voltage.
<b>Week 15</b>	relation between time and angle, Max- average value.
<b>Week 16</b>	rms value of alternating and sinusoidal voltage and current, phaser quantities.

## 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 theorem
Week 7	Lab 7: Maximum power transfer

## 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	N/A	





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	Computer Programming		Module Delivery
Module Type	Basic		Theory Lecture Lab Tutorial Practical Seminar
Module Code	ENG-105		
ECTS Credits	4		
SWL (hr/sem)	100		
Module Level	1	Semester (s) offered	2
Administering Department	Electrical Engineering	College	Engineering
Module Leader	Dr. Jalal N. Abdulbaqi	e-mail	Jalal.abdulbaqi@tu.edu.iq
Module Leader's Acad. Title	Lecturer	Module Leader's Qualification	Ph.D.
Module Tutor	Dr. Jalal N. Abdulbaqi	e-mail	Jalal.abdulbaqi@tu.edu.iq
Peer Reviewer Name	Name	e-mail	
Review Committee Approval	01/06/2023	Version Number	1.0

## Relation With Other Modules

### العلاقة مع المواد الدراسية الأخرى

Prerequisite module	ENG-104	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

<b>Module Aims</b> أهداف المادة الدراسية	<ul style="list-style-type: none"> <li>To introduce students to the Python programming language and its syntax.</li> <li>To provide students with an understanding of the conditional and iteration statements used in programming.</li> <li>To enable students to design and implement functions to solve programming problems.</li> <li>To introduce students to the basic data structures of Python, including lists, tuples, dictionaries, and sets.</li> <li>To provide students with an understanding of string manipulation and regular expressions in Python.</li> </ul>
<b>Module Learning Outcomes</b> مخرجات التعلم للمادة الدراسية	<ol style="list-style-type: none"> <li>Demonstrate an understanding of the Python programming language and its syntax.</li> <li>Design and implement conditional and iteration statements in Python.</li> <li>Design and implement functions to solve programming problems.</li> <li>Demonstrate an understanding of the basic data structures of Python, including lists, tuples, dictionaries, and sets.</li> <li>Demonstrate an understanding of string manipulation and regular expressions in Python.</li> <li>Demonstrate an understanding of how to deal with files and exceptions.</li> </ol>
<b>Indicative Contents</b> المحتويات الإرشادية	<ul style="list-style-type: none"> <li>Introduction to Python: syntax, data types, and control structures.</li> <li>Condition Statements: if, elif, and else statements.</li> <li>Iteration Statements: for and while loops.</li> <li>Functions: defining functions and parameter passing.</li> <li>Lists: creation, indexing, and slicing.</li> <li>Tuples: creation and unpacking.</li> <li>Dictionaries: creation and manipulation.</li> <li>Sets: creation and manipulation.</li> <li>Strings: creation, manipulation, and regular expressions.</li> <li>Files: creation, saving and manipulation.</li> </ul>
<b>Course Description</b>	This module introduces students to the Python programming language, its syntax, and its use in solving programming problems. The module covers the basic programming concepts of condition statements and iteration statements, along with the design and implementation of functions. The module also covers the basic data structures of Python, including lists, tuples, dictionaries, and sets. The module concludes with an introduction to string manipulation and regular expressions in Python.

## Learning and Teaching Strategies

### استراتيجيات التعلم والتعليم

<b>Strategies</b>	The module will be delivered through a combination of lectures, assignments, quizzes, and lab sessions. Lectures will provide an overview of the topics, while assignments and quizzes will enable students to apply their knowledge and check their understanding. Lab sessions will provide hands-on experience with Python programming tools and techniques. The module will also include self-directed learning, where students are expected to read and research on their own to enhance their understanding of the subject matter.
-------------------	--



### Student Workload (SWL) الحمل الدراسي للطلاب

Structured SWL (h/sem) الحمل الدراسي المنتظم للطلاب خلال الفصل	60	Structured SWL (h/w) الحمل الدراسي المنتظم للطلاب أسبوعياً	4
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطلاب خلال الفصل	40	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطلاب أسبوعياً	2.7
Total SWL (h/sem) الحمل الدراسي الكلي للطلاب خلال الفصل	100		

### Module Evaluation تقييم المادة الدراسية

		Time (hr)	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	10% (10)	2, 6, 14	LO # 1, 3, 6
	Assignments	2	15% (15)	3, 9, 11, 13	LO # 2, 4, 5
	Lab.	14	15% (15)	Continuous	
Summative assessment	Midterm Exam	1.5hrs	10% (10)	7	LO # 1-3
	Final Exam	3hrs	50% (50)	16	All
Total assessment			100% (100 Marks)		

### Learning and Teaching Resources مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Intro to Python® for Computer Science and Data Science: Learning to Program with AI, Big Data and the Cloud by Paul & Harvey Deitel, 1st Ed, Pearson Education, 2020	NO
Recommended Texts	جرار سوين، ترجمة: هشام رزق الله وآخرون، تعلم البرمجة مع بايثون 3، 2013 ألن داووني، ترجمة طارق زيد الكيالين، فكر بايثون: كيف تفكر كعالم حاسوب، منشورات جرين يت، 2012	NO
Websites	Python.org, learnpython.org, realpython.com	

## Delivery Plan (Weekly Syllabus)

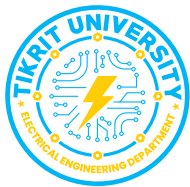
### المنهاج الاسبوعي النظري

	Material Covered
Week 1	Introduction to Python: syntax, data types, and control structures
Week 2	Condition Statements: if, elif, and else statements.
Week 3	Iteration Statement: while loop
Week 4	Iteration Statement: for loop
Week 5	Functions: defining functions and parameter passing.
Week 6	Functions: Libraries and their functions
Week 7	Midterm
Week 8	Lists: creation, indexing, and slicing.
Week 9	Tuples: creation and unpacking.
Week 10	Dictionaries: creation and manipulation.
Week 11	Sets: creation and manipulation.
Week 12	Strings: creation, manipulation, and regular expressions.
Week 13	Files
Week 14	Exceptions
Week 15	Array-Oriented Programming with "numpy"
Week 16	Final Exam

## Delivery Plan (Weekly Lab. Syllabus)

### المنهاج الاسبوعي للمختبر

	Material Covered
Week 1	Introduction to Python IDLE + mathematical manipulation
Week 2	Condition Statements
Week 3	Iteration Statements
Week 4	Functions
Week 5	List and Tuples
Week 6	Dictionaries and sets
Week 7	Strings and files



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	Computer Science		Module Delivery
Module Type	Basic		Theory Lecture Lab Tutorial Practical Seminar
Module Code	ENG-104		
ECTS Credits	4		
SWL (hr/sem)	100		
Module Level	1	Semester (s) offered	1
Administering Department	Electrical Engineering	College	Engineering
Module Leader	Dr. Jalal N. Abdulbaqi	e-mail	Jalal.abdulbaqi@ tu.edu.iq
Module Leader's Acad. Title	Lecturer	Module Leader's Qualification	Ph.D.
Module Tutor	Dr. Jalal N. Abdulbaqi	e-mail	Jalal.abdulbaqi@ tu.edu.iq
Peer Reviewer Name	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

<b>Module Aims</b> أهداف المادة الدراسية	The aim of this module is to provide students with a comprehensive understanding of the key concepts and principles of computer science. Through the study of topics such as history, data representation, computer components, algorithms, programming languages, operating systems, applications, internet and networking, and cybersecurity, students will gain a broad understanding of the field of computer science and how it has evolved over time.
<b>Module Learning Outcomes</b> مخرجات التعلم للمادة الدراسية	<ol style="list-style-type: none"> <li>1. Describe the historical development of computer science and its impact on society.</li> <li>2. Understand the various methods of data representation and manipulation.</li> <li>3. Identify the components of a computer and their functions.</li> <li>4. Design and implement algorithms for a range of problems.</li> <li>5. Understand the principles of programming languages and apply them to develop software.</li> <li>6. Understand the structure and functions of operating systems.</li> <li>7. Identify and analyze a range of applications of computer science.</li> <li>8. Understand the principles of internet and networking technologies.</li> <li>9. Identify and analyze various cybersecurity threats and methods of prevention.</li> </ol>
<b>Indicative Contents</b> المحتويات الإرشادية	<ul style="list-style-type: none"> <li>- History introduction: Evolution of computer science, pioneers and important milestones</li> <li>- Data representation: Binary numbers, hexadecimal, character sets, ASCII and Unicode</li> <li>- Computer components: CPU, memory, input/output devices, storage devices</li> <li>- Algorithms: Definition, representation, complexity, searching, sorting, optimization</li> <li>- Programming languages: Syntax, semantics, variables, functions, control structures, abstraction</li> <li>- Operating systems: Structure, file systems, process management, memory management</li> <li>- Applications: Databases, artificial intelligence, computer graphics, human-computer interaction</li> <li>- Internet and networking: Protocols, network architectures, security, privacy</li> <li>- Cybersecurity: Threats, attacks, prevention, detection, mitigation</li> </ul>
<b>Course Description</b>	This course offers students a comprehensive exploration of the fundamental concepts and principles that underpin the field of computer science. By delving into various subjects including the historical development of computing, data representation, computer components, algorithms, programming languages, operating systems, applications, internet and networking, and cyber-security, students will develop a well-rounded understanding of the discipline. By examining the evolution of computer science over time, students will acquire a broad perspective on the field and its significance in contemporary society. Through a combination of theoretical knowledge and practical applications, this module equips students with the necessary foundation to pursue further studies or careers in computer science.

## Learning and Teaching Strategies

### استراتيجيات التعلم والتعليم

<b>Strategies</b>	<p>The module will use a range of learning and teaching strategies, including:</p> <ul style="list-style-type: none"> <li>- Lectures: To provide students with an overview of the main concepts and principles.</li> <li>- Labs: To provide students with hands-on experience of programming, algorithms, and data representation.</li> <li>- Assignments and Quizzes: To provide students with opportunities to apply their knowledge and skills to real-world problems and check their understanding.</li> </ul>
-------------------	--



### Student Workload (SWL) الحمل الدراسي للطلاب

Structured SWL (h/sem) الحمل الدراسي المنتظم للطلاب خلال الفصل	60	Structured SWL (h/w) الحمل الدراسي المنتظم للطلاب أسبوعياً	4
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطلاب خلال الفصل Library, dorm, home memorizing 20 Preparation for tests 15 Homeworks 5	40	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطلاب أسبوعياً	2.7
Total SWL (h/sem) الحمل الدراسي الكلي للطلاب خلال الفصل	100		

### Module Evaluation تقييم المادة الدراسية

		Time (hr)	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	10% (10)	2, 4, 6, 10	LO #1, 3, 5 and 6
	Assignments	2	15% (15)	3, 5, 13, 14	LO # 2, 4, 7 and 8
	Lab.	14	15% (15)	Continuous	
Summative assessment	Midterm Exam	1.5hrs	10% (10)	7	LO # 1-5
	Final Exam	3hrs	50% (50)	16	All
Total assessment			100% (100 Marks)		

### Learning and Teaching Resources مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Computer Science Illuminated, by Dale, N and Lewis, J, 7th Ed, Jones & Bartlett Learning, 2020	NO
Recommended Texts	-	-
Websites		

## Delivery Plan (Weekly Syllabus)

### المنهاج الاسبوعي النظري

	Material Covered
Week 1	History introduction: Evolution of computer science, pioneers and important milestones
Week 2	Data representation: Binary numbers, hexadecimal, character sets, ASCII and Unicode
Week 3	Computer components: CPU, memory, input/output devices, storage devices
Week 4	Algorithms: Definition, representation, complexity, searching, sorting, optimization
Week 5	Programming languages I
Week 6	Programming languages II
Week 7	Midterm
Week 8	Operating systems I
Week 9	Operating systems II
Week 10	Applications I: Information Systems
Week 11	Applications II: artificial intelligence
Week 12	Applications III: computer graphics, human-computer interaction
Week 13	Networking
Week 14	Internet
Week 15	Cybersecurity: Threats, attacks, prevention, detection, mitigation
Week 16	Final Exam

## Delivery Plan (Weekly Lab. Syllabus)

### المنهاج الاسبوعي للمختبر

	Material Covered
Week 1	Lab 1: Computer Operating System (e.g. Microsoft Windows)
Week 2	Lab 2: Document Processing I (e.g. Microsoft Word)
Week 3	Lab 3: Document Processing II (e.g. Microsoft Word)
Week 4	Lab 4: Data Processing I (e.g. Microsoft Excel)
Week 5	Lab 5: Data Processing II (e.g. Microsoft Excel)
Week 6	Lab 6: Presentation Slides I (e.g. Microsoft PowerPoint)
Week 7	Lab 7: Presentation Slides II (e.g. Microsoft PowerPoint)





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 Techniques		Module Delivery
Module Type	Core		Theory Lecture Lab Tutorial Practical Seminar
Module Code	ELEC-122		
ECTS Credits	5		
SWL (hr/sem)	125		
Module Level	1	Semester (s) offered	
Administering Department	Electrical Engineering	College	Engineering
Module Leader	Dr. MOHAMMED KAMIL	e-mail	mohamedkamil@ tu.edu.iq
Module Leader's Acad. Title	Lecturer	Module Leader's Qualification	Ph.D.
Module Tutor	Dr. MOHAMMED KAMIL	e-mail	mohamedkamil@ tu.edu.iq
Peer Reviewer Name	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

<b>Module Aims</b> أهداف المادة الدراسية	The aim of this course is to present the engineering principles, theories, and practices, which are fundamental to the successful design of digital techniques by study of topics such as various types of number systems, Describe the operation of the logic gates, apply the basic laws and rules of Boolean algebra, use a Karnaugh map to simplify truth table functions, combinational Logic Using NAND and NOR Gates, and Pulse Waveform Operation.
<b>Module Learning Outcomes</b> مخرجات التعلم للمادة الدراسية	At the end of this course student will be able to: <ol style="list-style-type: none"> <li>1. Understand various types of number systems and their conversions.</li> <li>2. Implement the logic circuit utilizing the basic logic gates.</li> <li>3. Simplify the Boolean expressions and apply the Boolean theorems through logical gates.</li> <li>4. Use the Karnaugh map to simplify the expressions.</li> <li>5. Design and implement a variety of logical devices using combinational circuits.</li> <li>6. Construct timing diagrams showing the proper time relationships of inputs and outputs for the various logic gates.</li> </ol>
<b>Indicative Contents</b> المحتويات الإرشادية	<ol style="list-style-type: none"> <li>1. Introductory Concepts</li> <li>2. Number Systems and Arithmetic Operations</li> <li>3. Logic gates</li> <li>4. Boolean Algebra</li> <li>5. Logic Simplification</li> <li>6. Combinational Logic Analysis</li> </ol>
<b>Course Description</b>	Understand different types of number systems and their conversions. Foundation in design and analysis of the operation of digital gates. Concepts of Boolean algebra, Karnaugh maps, combinational Logic Using NAND and NOR Gates, and Pulse Waveform Operation

## Learning and Teaching Strategies

### استراتيجيات التعلم والتعليم

<b>Strategies</b>	The module will use a range of learning and teaching strategies, including: <ul style="list-style-type: none"> <li>- Lectures: To provide students with an overview of the main concepts and principles.</li> <li>- Labs: To provide students with hands-on experience of Design and implement variety of logical devices using combinational circuits concepts.</li> <li>- Assignments: To provide students with opportunities to apply their knowledge and skills to real-world problems.</li> </ul>
-------------------	--



### Student Workload (SWL) الحمل الدراسي للطلاب

Structured SWL (h/sem) الحمل الدراسي المنتظم للطلاب خلال الفصل	74	Structured SWL (h/w) الحمل الدراسي المنتظم للطلاب أسبوعياً	4.9
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطلاب خلال الفصل Library, dorm, home memorizing 35 Preparation for tests 20 Homeworks 20	51	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطلاب أسبوعياً	3.4
Total SWL (h/sem) الحمل الدراسي الكلي للطلاب خلال الفصل	125		

### Module Evaluation تقييم المادة الدراسية

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

### Learning and Teaching Resources مصادر التعلم والتدريس

	Text	Available in the Library?
<b>Required Texts</b>	Digital Fundamentals 11th edition, by: Thomas L. Floyd	YES
<b>Recommended Texts</b>	Digital Design 6th edition, by: M. Morris Mano	NO
<b>Websites</b>		

## Delivery Plan (Weekly Syllabus)

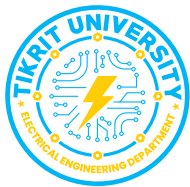
### المنهاج الاسبوعي النظري

	Material Covered
Week 1	Self Confidence – Character – Spirituality – Introduction to Yoga and meditation for professional excellence and stress management
Week 2	Digital concepts, General number formula: Binary, decimal numbers,
Week 3	Octal, Hexadecimal and BCD numbers.
Week 4	Numbers Arithmetic. 1's and 2's complement of binary numbers.
Week 5	Signed numbers, arithmetic operations with signed numbers.
Week 6	Logic gates: Invertor (NOT), AND, OR , NAND, NOR
Week 7	Logic gates: X-OR and X-NOR gates
Week 8	Midterm I exam
Week 9	Boolean operations and expressions, Law and rules of Boolean algebra
Week 10	DeMorgans theorems. Boolean analysis of Logic circuits
Week 11	Canonical and standard forms of Boolean expressions
Week 12	Boolean expressions and Truth table
Week 13	Simplifications using Boolean algebra
Week 14	The Karnaugh map, Karnaugh map SOP minimization
Week 15	Karnaugh map POS minimization
Week 16	Final Exam

## Delivery Plan (Weekly Lab. Syllabus)

### المنهاج الاسبوعي للمختبر

	Material Covered
Week 1	Lab 1: Study of logic gates: AND, OR, and NOT gates
Week 2	Lab 2: Study of logic gates: NOR, NAND, X-OR, and X_NOR gates
Week 3	Lab 3: Perform the Binary to Gray code conversion
Week 4	Lab 4: Realization of 7-Segments display.
Week 5	Lab 5: Realization of Boolean Algebra
Week 6	Lab 6: Realization of sum of product SOP
Week 7	Lab 7: Realization of product of sum POS



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	Engineering Mechanics		Module Delivery
Module Type	Basic		Theory Lecture Tutorial
Module Code	ENG-102		
ECTS Credits	4		
SWL (hr/sem)	100		
Module Level	1	Semester (s) offered	1
Min number of students	15	Max number of students	100
Administering Department	Electrical Engineering	College	Engineering
Module Leader	Aous Naji Rasheed	e-mail	eng.aous@tu.edu.iq
Module Leader's Acad. Title	Assistant Lecturer	Module Leader's Qualification	Msc
Module Tutor	Sabah Mahdi Salih	e-mail	sabahmahdi@tu.edu.iq
Review Committee Approval	01/06/2023	Version Number	1.0

## Relation With Other Modules

### العلاقة مع المواد الدراسية الأخرى

<b>Prerequisite module</b>	None	Semester	-
<b>Co-requisites module</b>	None	Semester	-

## Module Aims, Learning Outcomes, Indicative Contents and Brief Description

### أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية مع وصف مختصر

<b>Module Aims</b> أهداف المادة الدراسية	<ol style="list-style-type: none"> <li>1) To provide definition of force and moment vectors and give necessary vector algebra</li> <li>2) To explain the concept of equilibrium of particles and rigid bodies in plane and 3D space</li> <li>3) To give information about support types and to give ability to calculate support reactions</li> <li>4) To explain the equilibrium of structures and internal forces in trusses, and frames</li> <li>5) To give information about distributed loads</li> <li>6) To explain centroid concept</li> <li>7) To provide information on moment of inertia</li> </ol>
<b>Module Learning Outcomes</b> مخرجات التعلم للمادة الدراسية	<ol style="list-style-type: none"> <li>1. Use both conceptual and numerical techniques to solve engineering problems.</li> <li>2. Analyze and develop free-body diagrams for any system of forces in two and three dimensions.</li> <li>3. Understand and use the general idea of equilibrium of a particle.</li> <li>4. Understand and use the general ideas of force system resultants.</li> <li>5. Determine the moment of a force about an arbitrary point and/or axes</li> <li>6. Analyze the equilibrium of rigid bodies under any system of forces.</li> <li>7. Analyze trusses, beams, frames, and machines.</li> <li>8. Understand and use the general ideas of internal forces and draw shear and moment diagrams.</li> <li>9. Calculate center of gravity, centroids, and moments of inertia.</li> <li>10. Apply friction forces and analyze their different applications.</li> </ol>
<b>Indicative Contents</b> المحتويات الإرشادية	<p>Indicative content includes the following.</p> <ul style="list-style-type: none"> <li>• Force Vectors (8 hrs)</li> <li>• Force System Resultants (8 hrs)</li> <li>• Equilibrium of a Rigid Body (8 hrs)</li> <li>• Friction (8 hrs)</li> <li>• Center of Gravity and Centroid (6 hrs)</li> <li>• Moments of Inertia (8 hrs)</li> <li>• Structure and Frames (10 hrs)</li> </ul>
<b>Course Description</b>	<p>The course covers the following topics; statics of particles: forces in plane, forces in space, equilibrium, moment of a force, moment of a couple, equivalent systems of forces on rigid bodies, equilibrium in two dimensions, equilibrium in three dimensions, distributed forces: centroids and center of gravity, analysis of structures: trusses, frames and machines, internal forces in beams and cables, friction, moments of inertia of areas, moments of inertia of masses.</p>

## Learning and Teaching Strategies

### استراتيجيات التعلم والتعليم

<b>Strategies</b>	<p>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.</p>
-------------------	---



### Student Workload (SWL) الحمل الدراسي للطالب

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل In class lectures 50 In class tests 5 Seminars 4 Discussions 6	59	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعياً	3.9
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل Library, dorm, home memorizing 30 Preparation for tests 20 Homeworks 10	41	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعياً	2.74
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
<b>Formative assessment</b>	Quizzes	2	10% (10)	5, 10, 12, 14	LO #1, 2, 3, and 4
	Assignments (Homeworks)	5	10% (10)	2, 4, 6, 8, 10	LO # 1, 2, 3, 4, 5 and 6
	Seminars.	4	8% (8)	Continuous	
	Discussions	6	12% (12)	Continuous	
<b>Summative assessment</b>	Midterm Exam	2hrs	10% (10)	7	LO # 1-5
	Final Exam	3hrs	50% (50)	16	All
<b>Total assessment</b>			100% (100 Marks)		

## Delivery Plan (Weekly Syllabus)

### المنهاج الاسبوعي النظري

	Material Covered
Week 1	General principles, Principles of statics, vectors
Week 2	Planar forces, resultant of a force system
Week 3	Planar forces, resultant of a force system
Week 4	Numbers Arithmetic. 1's and 2's complement of binary numbers.
Week 5	The free body diagram, definition of moment, moment of a couple
Week 6	The free body diagram, definition of moment, moment of a couple
Week 7	Equilibrium in 2-D, free body diagrams, equations of equilibrium
Week 8	Midterm exam
Week 9	Equilibrium in 3-D, free body diagrams, equations of equilibrium
Week 10	Structures Trusses and Frames
Week 11	Structures Trusses and Frames
Week 12	Center of mass, Gravity and centroid
Week 13	Centroids of Lines, Areas, and Volumes
Week 14	Moment of inertia
Week 15	Friction (dry friction)
Week 16	Final Exam

## Learning and Teaching Resources

### مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Engineering Mechanics-Statics, J.L.Meriam, L.G.Kraige, Wiley, 5th Edition, 2003, ISBN: 0-471-26607-8	YES
Recommended Texts	Engineering Mechanics-Statics, Hibbeler, R.C.13th Edition, Pearson Prentice Hall, 2016, ISBN 978-0-13-31892-2."	YES
Websites		





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	ELECTRONICS PHYSICS		Module Delivery
Module Type	Core		Theory Lecture Tutorial
Module Code	ELEC-115		
ECTS Credits	6		
SWL (hr/sem)	150		
Module Level	1	Semester (s) offered	1
Administering Department	Electrical Engineering	College	Engineering
Module Leader	Dr. SAAD GAZAI	e-mail	saad.g.mutlak@ tu.edu.iq
Module Leader's Acad. Title	Lecturer	Module Leader's Qualification	Ph.D.
Module Tutor	Dr. SAAD GAZAI	e-mail	saad.g.mutlak@ 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		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

<b>Module Aims</b> أهداف المادة الدراسية	This module aims to introduce basic concepts and analysis of semiconductor physics and devices, taking this knowledge toward understanding electronic and optoelectronic device principles and to be extended afterwards into real-world circuit basic operation. The module has a few main topics including background of single/compound semiconductors, PN-junction/ Schottky barrier diode operations, and structures. Solar cells, LEDs and Laser diodes are also provided in this module, linking the delivered background with new optical devices technology.
<b>Module Learning Outcomes</b> مخرجات التعلم للمادة الدراسية	At Completing of this module, the student should be able to: <ol style="list-style-type: none"> <li>1. Understand the basic concepts of intrinsic and extrinsic semiconductor energy bands (N-type and P-type semiconductors) mainly for Silicon, Germanium and Gallium Arsenide and how to differentiate among them.</li> <li>2. Further understand carrier concentration (electron/hole) and distribution in semiconductors along with carrier transport mechanism and electrical properties, involving mobility, carrier lifetime, etc.</li> <li>3. Study and analysis of PN-junction diodes in equilibrium and under forward/reverse bias voltages, followed by semiconductor-metal contact Schottky barrier diode.</li> <li>4. Build small signal equivalent circuit model of PN-junction diode according to the described I-V characteristic and capacitance of the diode.</li> <li>5. Understand operation principle of a few types of electronic and optoelectronic devices such as Varactor and high-speed tunnel-based devices and PIN-Photodiodes, Solar cells, LEDs, and Laser diodes.</li> <li>6. Extend this knowledge into understand the importance of electronic/optoelectronic devices for real-world recent technology.</li> </ol>
<b>Indicative Contents</b> المحتويات الإرشادية	<ol style="list-style-type: none"> <li>1. Energy-band Theory of Intrinsic/Extrinsic III-V Semiconductors</li> <li>2. Carrier Concentration/Distribution and Transport Mechanism</li> <li>3. PN-junction/Schottky barrier Diodes and their Structure Analysis</li> <li>4. Small Signal Model of Diodes</li> <li>5. Varactor/Tunnel Diodes Principle and Applications</li> <li>6. Photodiodes and Photovoltaic Solar Cells</li> <li>7. LEDs and Laser Semiconductor Diodes</li> <li>8. Clean-room Classes and Modern Optical Receiver Technologies</li> </ol>
<b>Course Description</b>	The fundamental concepts and analyses of semiconductor physics for electronic and optoelectronic devices are covered in this course. The background of single/compound semiconductors, PN-junction operation, and structure are a few of the module's primary subjects. Additionally, this module provides key knowledge of solar cells, LEDs, and laser diodes that link principal operation to modern optical device technology.

## Learning and Teaching Strategies

### استراتيجيات التعلم والتعليم

<b>Strategies</b>	The module will use a range of learning and teaching strategies, including: <ul style="list-style-type: none"> <li>- Lectures and Tutorials: To provide a general overview and key-ideas of the module, to be followed by tutorial classes dedicated to solving a few additional examples on the delivered topics.</li> <li>- Quizzes: Promote students of their progress and self-evaluation as they receive immediate feedback on their answers. And this can show them where they need to improve while also emphasizing their accomplishments.</li> <li>- Assignments: To offer students the chance to use their understanding of the delivered module materials to independently solve problems, resulting in improved module comprehension.</li> </ul>
-------------------	--



### Student Workload (SWL) الحمل الدراسي للطلاب

Structured SWL (h/sem) الحمل الدراسي المنتظم للطلاب خلال الفصل	77	Structured SWL (h/w) الحمل الدراسي المنتظم للطلاب أسبوعياً	5.1
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطلاب خلال الفصل Library, dorm, home study           35 Preparation for tests                   20 Homework                                   20	73	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطلاب أسبوعياً	4.86
Total SWL (h/sem) الحمل الدراسي الكلي للطلاب خلال الفصل	150		

### Module Evaluation تقييم المادة الدراسية

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

## Delivery Plan (Weekly Syllabus)

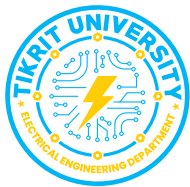
### المنهاج الاسبوعي النظري

	Material Covered
Week 1	HUMAN VALUES: Respect for others – Living peacefully – Caring – Sharing – Honesty. Energy-band theory of metals, insulators and semiconductors, crystal structure, ionic, covalent, and metallic bonding.
Week 2	Semiconductors materials (Si, Ge and compound semiconductors), intrinsic and extrinsic semiconductors.
Week 3	Fermi-level in intrinsic and extrinsic semiconductors, energy distribution of electrons, temperature effect.
Week 4	Carrier concentration, diffusion, carrier lifetime, mobility, conductivity, and drift velocity in III-V single and compound semiconductors.
Week 5	PN-junction under equilibrium condition, forward and reverse bias voltages effect, current-voltage characteristic, design dimensions and doping effect.
Week 6	Schottky barrier diode, ideality factor and comparison with the conventional PN-junction diode.
Week 7	Midterm I Exam.
Week 8	Depletion region width of PN-junction and maximum electric field. Hall effect basic of principle and applications.
Week 9	Diode capacitance and diffusion capacitance, small-signal model of diode, high-frequency impact on diode model.
Week 10	Dielectric constant (real and imaginary parts) in semiconductors, metals, and insulators.
Week 11	Varactor diode, heavily doped PN-tunnel diode, single barrier tunnel diode and their importance in voltage-controlled oscillator (VCO) and THz-emitters.
Week 12	Basic principle of photodiodes, mainly PIN-diode and its characteristics (i.e., dark and photocurrents, responsivity). Silicon and GaAs photovoltaic (solar) cells, maximum output power and efficiency and recent applications.
Week 13	Dual nature of light, principle and operation of light emitting diodes (LEDs), device structure and characteristics (i.e., conversion efficiency, quantum efficiency, spectral properties, etc.) and real-world applications.
Week 14	Semiconductor laser diodes, electron-hole recombination conventional laser, quantum cascade laser devices, basic principles, structures, design calculations and applications.
Week 15	Clean-room classes, Semiconductor integrated circuits processing and fabrication steps, introduction toward high-speed optical transceiver technology.
Week 16	Final Exam

## Learning and Teaching Resources

### مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	الفيزياء الالكترونية تأليف د. مظفر النعمة و د. وكاع فرمان الجبوري	YES
Recommended Texts	Semiconductor Devices Physics and Technology 3rd edition, by: S. M. SZE and M. K. LEE	No, however, this book is available online (Students can go through it online).
Websites		



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	Engineering drawing		Module Delivery
Module Type	Suplement		Theory Lecture Lab Tutorial Practical
Module Code	ENG-101		
ECTS Credits	4		
SWL (hr/sem)	100		
Module Level	1	Semester (s) offered	1
Administering Department	Civil Engineering	College	Engineering
Module Leader	Qusay Oglah Salih	e-mail	Qusay.o.salih@ tu.edu.iq
Module Leader's Acad. Title	Assistant lecturer	Module Leader's Qualification	Masters degree
Module Tutor	Prof. Dr. Waleed Muhammad	e-mail	walabdraba@ 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

<b>Module Aims</b> أهداف المادة الدراسية	<ol style="list-style-type: none"><li>1. Define and explain the uses of different drawing equipment.</li><li>2. Identify the different drawing equipment.</li><li>3. Layout drawing papers and prepare a title block.</li><li>4. Practically distinguish the types of dimensioning.</li><li>5. Carry out geometrical construction of different shapes.</li><li>6. Carry out isometric and orthographic drawing of objects.</li></ol>
<b>Module Learning Outcomes</b> مخرجات التعلم للمادة الدراسية	<p>On completion of this course students will be able to:</p> <ol style="list-style-type: none"><li>1. Prepare and understand drawings.</li><li>2. Identify various curves used in Engineering Drawing and their applications.</li><li>3. Use the principles of orthographic projections.</li><li>4. By studying about isometric projections students will be able to visualize three-dimensional objects and that will enable them to design new products.</li><li>5. Design and fabricate surfaces of different shapes.</li><li>6. Represent the objects in three dimensional appearances</li></ol>
<b>Indicative Contents</b> المحتويات الإرشادية	<p>Indicative content includes the following.</p> <ul style="list-style-type: none"><li>• Introduction to Drawing Equipment (6hrs)</li><li>• Geometrical Construction (12hrs)</li><li>• Orthographic Projection (9hrs)</li><li>• Sectional views(6hrs)</li><li>• Isometric Projections(9hrs)</li><li>• Dimensioning(3hrs)</li></ul>
<b>Course Description</b>	<p>An engineering drawing course focuses on usage of drawing instruments, lettering, construction of geometric shapes, etc. Students study use of dimensioning, shapes and angles or views of such drawings. Dimensions feature prominently, with focus on interpretation, importance and accurate reflection of dimensions in engineering drawing. Other areas of study in this course may include projected views and development of surfaces..</p>

## Learning and Teaching Strategies

### استراتيجيات التعلم والتعليم

<b>Strategies</b>	<p>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.</p>
-------------------	---



<b>Student Workload (SWL)</b> الحمل الدراسي للطلاب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطلاب خلال الفصل In class lectures 42 In class tests 3	45	Structured SWL (h/w) الحمل الدراسي المنتظم للطلاب أسبوعياً	<b>3</b>
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطلاب خلال الفصل Library, dorm, home memorizing 31 Preparation for tests 7 Homeworks 17	55	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطلاب أسبوعياً	<b>3.66</b>
Total SWL (h/sem) الحمل الدراسي الكلي للطلاب خلال الفصل	150		

<b>Module Evaluation</b> تقييم المادة الدراسية					
		Time (hr)	Weight (Marks)	Week Due	Relevant Learning Outcome
<b>Formative assessment</b>	Quizzes	2	10% (10)	All	LO #1, 2, 3, and 4
	Assignments	6	30% (30)	All	LO # 1, 2, 3, 4, 5 and 6
<b>Summative assessment</b>	Midterm Exam	2hrs	10% (10)	7	LO # 1-3
	Final Exam	3hrs	50% (50)	16	All
<b>Total assessment</b>			100% (100 Marks)		

## Delivery Plan (Weekly Syllabus)

### المنهاج الاسبوعي النظري

	Material Covered
Week 1	Introduction to engineering drawing
Week 2	Primary elements of drawings
Week 3	Geometrical Construction
Week 4	Tangency
Week 5	Loci applications
Week 6	Tangency and loci applications
Week 7	Dimensioning
Week 8	Theory of Projection
Week 9	Orthographic Projections
Week 10	Orthographic Projections
Week 11	Sections and Sectional views
Week 12	Sections and Sectional views
Week 13	Isometric Projections
Week 14	Isometric Projections
Week 15	Isometric Projections
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	SIMMONS, C., MAGUIRE, D., PHELPS, N., 2021. Manual of engineering Drawing Technical product specification and Documentation to British and International Standards, 4 ed, Elsevier Ltd:Oxford REDDY, K. , 2008. Textbook of Engineering Drawing. 2ed, Adithya Art Printers:Hyderabad SHAH, M. B. , RANA, B. C. , 2007. Engineering Drawing. 2ed, Dorling Kindersley(India) Pvt. Ltd :India	No
Websites		





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	Workshops SKILLS		Module Delivery
Module Type	Core		Theory Lecture Tutorial Practical Seminar
Module Code	ENG-106		
ECTS Credits	5		
SWL (hr/sem)	125		
Module Level	1	Semester (s) offered	
Administering Department	All Departments	College	Engineering
Module Leader	Abd fares Ali	e-mail	abdfaris@tu.edu.iq
Module Leader's Acad. Title	Lecturer	Module Leader's Qualification	MSC.
Module Tutor	Mahmoud Shukri Dirar	e-mail	mahmoed_alosi@ yahoo.com
Peer Reviewer Name	Abbas Ali & Qais k. Shaakir	e-mail	Kanoosh.abbasa- li@tu.edu.iq / qshaakir@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

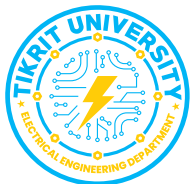
<b>Module Aims</b> أهداف المادة الدراسية	Theoretical and practical training in which the student is scientifically and technically established with the most necessary skills in the field of engineering technology
<b>Module Learning Outcomes</b> مخرجات التعلم للمادة الدراسية	On completion of this course 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
<b>Indicative Contents</b> المحتويات الإرشادية	Indicative content includes the following. 1. Industrial safety workshop (2 hours) 2. Measurement & Marking workshop (3 hours) 3. Filing workshop (10 hours) 4. Carpentry workshop (10 hours) 5. Welding workshop (10 hours) 6. Casting workshop (10 hours) 7. Machining workshop (10 hours) 8. plumbing workshop (10 hours) 9. Electrical workshop (10 hours)
<b>Course Description</b>	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

<b>Strategies</b>	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 In class lectures 75 In class tests 9	73	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعياً	4.8
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل Library, dorm, home memorizing 22 Preparation for tests 20 Homeworks 24	52	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعياً	3.46
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
<b>Formative assessment</b>	Quizzes	9	5% (5)	All	LO #1, 2, 3, and 9
	Assignments	9	15% (15)	All	LO # 1, 2, 3, 4, 5 and 9
<b>Summative assessment</b>	Midterm Exam	2hrs	30% (30)	7	LO # 1-5
	Final Exam	3hrs	50% (50)	16	All
<b>Total assessment</b>			100% (100 Marks)		

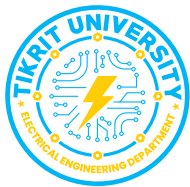
## Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري

	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

## Learning and Teaching Resources

### مصادر التعلم والتدريس

	Text	Available in the Library?
<b>Required Texts</b>	Abd fares , Engineering workshops	YES
<b>Recommended Texts</b>	Technology of Machine Tools , Steve F. Krar & J. William Oswald ,McGraw-Hill Publishing Company , fourth Edition , 1991	No
<b>Websites</b>		



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	English Language		Module Delivery
Module Type	S		Theory Lecture Tutorial Practical Seminar
Module Code	ENG-108		
ECTS Credits	2		
SWL (hr/sem)	50		
Module Level	1	Semester (s) offered	
Administering Department	All Departments	College	Engineering
Module Leader		e-mail	
Module Leader's Acad. Title	Lecturer	Module Leader's Qualification	.
Module Tutor		e-mail	
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

<b>Module Aims</b> أهداف المادة الدراسية	Develop the ability/skill needed to discover/innovate/create, as demonstrated by students possessing critical thinking skills to assess ideas, acquiring research skills, synthesizing knowledge across disciplines or applying academic knowledge to self-life problems.
<b>Module Learning Outcomes</b> مخرجات التعلم للمادة الدراسية	<ol style="list-style-type: none"> <li>1. Identify various reading skills and apply them in reading, referencing and summarizing literature on engineering</li> <li>2. Identify various skills of technical presentation and apply them in conducting short technical presentations based on information extracted from readings</li> <li>3. Identify technical discussion skills and apply these in planning and conducting simulated technical discussions characteristic of those that go on in engineering contexts.</li> <li>4. Identify and compare the structures and language characteristics of various types of written study and workplace reports characteristic of those produced by engineering students and practicing engineers (e.g., incident reports and progress reports) mainly, and applying this knowledge in writing one of the latter</li> </ol> <p>Develop communication skills through active participation in class and group activities.</p>
<b>Indicative Contents</b> المحتويات الإرشادية	<p>Indicative content includes the following.</p> <ul style="list-style-type: none"> <li>• Technical presentations (5 hrs)</li> <li>• Conducting technical discussions about engineering projects (5 hrs)</li> <li>• Writing technical documents (5 hrs)</li> <li>• Writing business correspondence (5 hrs)</li> </ul>
<b>Course Description</b>	This course is designed to provide engineering students with the necessary oral and written skills required for effective communication in academic and workplace contexts, both with experts in their field and lay persons. It begins by introducing them to the principles of good academic practice, which are also presented as a model for ethical workplace practice, and thus help them to avoid issues such as plagiarism. The main part then leads on to developing research and summarizing skills that form the basis for the later activities. Students next learn to apply these skills to conducting technical presentations, as well as in group discussions that culminate in project planning activities.

## Learning and Teaching Strategies استراتيجيات التعلم والتعليم

<b>Strategies</b>	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.
-------------------	--



<b>Student Workload (SWL)</b> الحمل الدراسي للطلاب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطلاب خلال الفصل In class lectures 11 In class tests 9	30	Structured SWL (h/w) الحمل الدراسي المنتظم للطلاب أسبوعياً	2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطلاب خلال الفصل Library, dorm, home memorizing 31 Preparation for tests 7 Homeworks 17	20	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطلاب أسبوعياً	1.3
Total SWL (h/sem) الحمل الدراسي الكلي للطلاب خلال الفصل	50		

<b>Module Evaluation</b> تقييم المادة الدراسية					
		Time (hr)	Weight (Marks)	Week Due	Relevant Learning Outcome
<b>Formative assessment</b>	Quizzes	9	5% (5)	All	LO #1, 2, 3, and 9
	Assignments	9	15% (15)	All	LO # 1, 2, 3, 4, 5 and 9
<b>Summative assessment</b>	Midterm Exam	2hrs	30% (30)	7	LO # 1-5
	Final Exam	3hrs	50% (50)	16	All
<b>Total assessment</b>			100% (100 Marks)		

## Delivery Plan (Weekly Syllabus)

### المنهاج الاسبوعي النظري

	Material Covered
Week 1	
Week 2	A technical presentation. Students will perform various secondary research skills acquired to extract information of an engineering topic from different sources. They will then conduct a short technical presentation based on this information, using the presentation skills learnt
Week 3	
Week 4	Technical discussions and proposal writing Incorporating research results from the previous activities, students will develop a customized solution to address a context-specific problem facing a client's organization. The solution will need to be written in a recognized proposal format (e.g., a blueprint). Each student will craft one section of the document according to her/his role on the project team. Students will also plan and conduct a simulated technical team meeting with the client team to explain and discuss the solution by applying various planning and discussion skills learnt
Week 5	
Week 6	
Week 7	Midterm exam
Week 8	Conducting technical discussions about engineering projects Students will be guided to identify technical discussion skills through various types of exploratory and/or consciousness-raising activities, such as watching sample discussions and evaluating their effectiveness. They learn how to discuss with a client the customized technical design of a solution that can address a context-specific problem facing the client. They then apply these skills in conducting simulated technical team discussions, according to the roles assigned to them.
Week 9	
Week 10	
Week 11	A technical report Each student produces a technical report by applying the knowledge gained in the related TLAs
Week 12	
Week 13	
Week 14	Writing business correspondence Students will produce a business email, based on the results of the previous activities, and by applying the textual features learnt.
Week 15	
Week 16	Final Exam

## Learning and Teaching Resources

### مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Beer, D. & McMurrey, D. 2004, A Guide to Writing as an Engineer (2nd ed), New York: Wiley	No
Recommended Texts	Borowick, Jerome N., 2002, Technical Communication and its Applications (2nd ed), New Jersey: Prentice-Hall, Inc.	No
Websites		





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	Engineering Analysis		Module Delivery
Module Type	Basic		محاضرات نظرية
Module Code	Math-201		
ECTS Credits	5		
SWL (hr/sem)	125		
Module Level	1	Semester (s) offered	1
Min number of students		Max number of students	100
Administering Department		College	
Module Leader		e-mail	
Module Leader's Acad. Title		Module Leader's Qualification	.
Module Tutor		e-mail	
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		Semester	1
Co-requisites module		Semester	-

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

<b>Module Aims</b> أهداف المادة الدراسية	1- Develop an understanding of different mathematical methods used to model engineering applications Ability to implement and solve mathematical models for engineering problems
<b>Module Learning Outcomes</b> 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. Apply engineering principles to real-world problems.
<b>Indicative Contents</b> المحتويات الإرشادية	Indicative content includes the following. • First Order Ordinary Differential Equations (10hrs) • Second Ordinary Differential Equations (10hrs) • Simultaneous Linear Differential Equations (10hrs) • Laplace Transform: (15hrs) • Fourier Series (15hrs) Partial Differential Equations (15hrs)
<b>Course Description</b>	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.

## Learning and Teaching Strategies استراتيجيات التعلم والتعليم

<b>Strategies</b>	1- 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. 2- 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. 3- 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 للطلاب

Structured SWL (h/sem) الحمل الدراسي المنتظم للطلاب خلال الفصل In class lectures In class tests		Structured SWL (h/w) الحمل الدراسي المنتظم للطلاب أسبوعياً	
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطلاب خلال الفصل Library, dorm, home memorizing Preparation for tests Homeworks		Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطلاب أسبوعياً	
Total SWL (h/sem) الحمل الدراسي الكلي للطلاب خلال الفصل			

### Module Evaluation

#### تقييم المادة الدراسية

		Time (hr)	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment					
Summative assessment					
Total assessment			100% (100 Marks)		

## Delivery Plan (Weekly Syllabus)

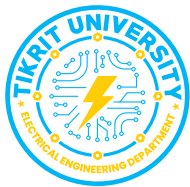
### المنهاج الاسبوعي النظري

	Material Covered
Week 1	First Order Ordinary Differential Equations: Separable Equations
Week 2	First Order Ordinary Differential Equations: Linear Equations; Exact Equations
Week 3	Second Ordinary Differential Equations: Homogeneous; Non- Homogeneous
Week 4	Second Ordinary Differential Equations: The Euler Cauchy Differential Equations; Power Series Solutions
Week 5	Simultaneous Linear Differential Equations
Week 6	Simultaneous Linear Differential Equations
Week 7	Special Functions: Gamma Function
Week 8	Special Functions: Euler Beta Function
Week 9	Laplace Transform: - The General Method - The Transform of Special Functions
Week 10	Laplace Transform: - The Shifting Theorems - The Differentiation and Integration of Transforms - Solving Differential Equations by Laplace Transform
Week 11	Fourier Series - The Euler Formulas - Half Range Expansio
Week 12	Fourier Transform - Properties of Fourier Transform - Solving Differential Equations by Fourier Transform
Week 13	Orthogonality Properties of Sine and Cosine
Week 14	Partial Differential Equations - Separation of Variables (Heat Equations)
Week 15	Partial Differential Equations - Separation of Variables (Wave Equations)
Week 16	Final Exam

## Learning and Teaching Resources

### مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Advanced Engineering Analysis C. Ray Wylie	Yes
Recommended Texts	Advanced Engineering Mathematics, 5th ed., D.G. Zill and M.R. Cullen. Advanced Engineering Analysis, 10th ed., Erwin K	Yes
Websites	N/A	



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	Arithmetic programming		Module Delivery
Module Type	Core		محاضرات نظرية
Module Code	Elec-213		
ECTS Credits	4		
SWL (hr/sem)	100		
Module Level		Semester (s) offered	2
Min number of students	25	Max number of students	80
Administering Department	Electrical Engineering	College	Engineering
Module Leader	Assistant Luma A.Almajeed	e-mail	Lama.a.alma- jeed@tu.edu.iq
Module Leader's Acad. Title	Assistant	Module Leader's Qualification	M.a
Module Tutor	None	e-mail	None
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	ENG-105	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

<b>Module Aims</b> أهداف المادة الدراسية	The subject of programming using the Matlab language aims at the student learning during the academic year an idea of the program's specifications, design and development of algorithm, coding, and a test using the modern software development environment. Students learn how to write programs at a high level of object programming. The basic topics of algorithms include plans, problem solving, programming concepts, classes, styles, monitoring structures, matrices, and chains. Throughout the semester, problems with problem solving and applying them will be confirmed to solve computer problems and develop the student's mind and enables him to write any program in the language of Matlab, the purpose we envision from teaching this article is to establish the theoretical principles and foundations that depend on writing, implementing and understanding programs in the language of Matlab absolutely.
<b>Module Learning Outcomes</b> مخرجات التعلم للمادة الدراسية	1- A During the school year, the student learns an idea of programming in Matlab and how to write a program. 2- Learn and understand the types of algorithms and how to write them. 3- Learn and understand how to use programming in modern communications 4- Learn and understand how to use programming to draw plans and figures.
<b>Indicative Contents</b> المحتويات الإرشادية	Indicative content includes the following. <ul style="list-style-type: none"> <li>• Introduction to Matlab, Command Window and Basic Arithmetic . (2 hrs)</li> <li>• Vectors , Matrices , Matrix Arithmetic (6 hrs)</li> <li>• 2D plotting commands , plot, subplot , 3D plots , Graphics of functions of two variables. (4 hrs)</li> <li>• Solving equations , plotting symbolic equations , system of equations (4 hrs)</li> <li>• Flow Control and M-files (6 hrs)</li> <li>• 3D matrix , display images , read images (6 hrs)</li> </ul> Simulink: <ul style="list-style-type: none"> <li>• Introduction to matlab simulink , simulink libraries , Building Models , Simulation Parameters(6 hrs)</li> </ul>
<b>Course Description</b>	Urging the student to think about the importance of programming using the Matlab language in facilitating contemporary life. A2-Urging the student to think about the importance of the influence of Matlab on the development of scientific research methods. A3-Urging the student to think and follow the rapid development of Matlab language. A 4- Urging the student to think about ways to write programs for Windows applications or games.

## Learning and Teaching Strategies استراتيجيات التعلم والتعليم

<b>Strategies</b>	Designing a special strategy through the lectures given to students for the basic and necessary programming that students need in the later stages, and giving students enough time to implement basic programs using the laboratory
-------------------	--



## Student Workload (SWL) الحمل الدراسي للطلاب

Structured SWL (h/sem) الحمل الدراسي المنتظم للطلاب خلال الفصل In class lectures 54 In class tests 5	60	Structured SWL (h/w) الحمل الدراسي المنتظم للطلاب أسبوعياً	4.0
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطلاب خلال الفصل HomeWorks 10	40	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطلاب أسبوعياً	2.6
Total SWL (h/sem) الحمل الدراسي الكلي للطلاب خلال الفصل	100		

## Module Evaluation تقييم المادة الدراسية

		Time (hr)	Weight (Marks)	Week Due	Relevant Learning Outcome
<b>Formative assessment</b>	Quizzes	1	6%		
	Assignments	1	6%		
	Seminars.				
<b>Summative assessment</b>	Midterm Exam	2hrs	14%		
	Final Exam	1hrs	50%		
<b>Total assessment</b>			100% (100 Marks)		

## Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري

	Material Covered
Week 1	MATLAB Basic
Week 2, 3,4	introduction to Vectors and Matrices
Week5,6	2D plotting commands , plot, subplot , 3D plots , Graphics of functions of two variables
Week 7,8	Solving equations , plotting symbolic equations , system of equations
Week 9,10	Flow Control and M-files
Week 11,12	3D matrix , display images , read images
Week 13,14,15	Simulink: Introduction to matlab simulink , simulink libraries , Building Models , Simulation Parameters
Week 16	Final Exam

## Delivery Plan (Weekly Syllabus)

### المنهاج الاسبوعي النظري

	Material Covered
Week 1	Lab 1: MATLAB Basic
Week 2, 3,4	Lab 2: Vectors and Matrices
Week5,6	Lab 3: plotting commands
Week 7,8	Lab 4: Solving equations
Week 9,10	Lab 5: Flow Control and M-files
Week 11,12	Lab 6: 3D matrix , display images , read images
Week 13,14,15	Lab 7: Simulink:

## Learning and Teaching Resources

### مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	essential MATLAB for Engineers and Scientists 3rd A Guide to MATLAB Matlab C++ - Math Library	Yes
Recommended Texts	Learn to program with matlab	No
Websites	N/A	





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	Electric fields		Module Delivery
Module Type	Core		Theory Lecture Lab Tutorial Practical Seminar
Module Code	Elec-217		
ECTS Credits	5		
SWL (hr/sem)	125		
Module Level	UGxII 2	Semester (s) offered	
Administering Department	Electrical Engineering	College	Engineering
Module Leader	Qais K. Shaakir	e-mail	E-mail: qshaakir@ tu.edu.iq
Module Leader's Acad. Title	Assistant Lecturer	Module Leader's Qualification	MSc.
Module Tutor	Assistant Lecturer: Qais K. Shaakir	e-mail	E-mail: qshaakir@ 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	ELEC-115	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

<b>Module Aims</b> أهداف المادة الدراسية	<ul style="list-style-type: none"> <li>Identify the physical nature of the electric fields and its sources, then learn about the electric flux and its laws, especially Gauss' law for flux density calculations.</li> <li>Familiarize the student with methods for calculating the energy and work spending in moving the charges through an electric field, also the potential difference between two points, and the potential of the electric diode. The student must be able to defining and finding the capacitance, between conductors by Poisson's and Laplace's equations, and its applications.</li> </ul>
<b>Module Learning Outcomes</b> مخرجات التعلم للمادة الدراسية	<ol style="list-style-type: none"> <li>1. Explain the methods for representations the electromagnetic fields in three dimensions coordinate systems</li> <li>2. Define Coulomb's law.</li> <li>3. Identify the nature of electric field features and sources.</li> <li>4. Discuss the Faraday's experiment to understand the electric flux concept</li> <li>5. Explain how can use of Gauss's law to determine the flux density.</li> <li>6. Discuss the energy and work done in moving of electric charges through electric fields.</li> <li>7. Discuss the potential and potential difference.</li> <li>8. Explain how Maxwell was find its first equation.</li> <li>9. Identify the capacitor and how can determine the varies types of capacitance.</li> <li>10. Explain the importance of Poisson's equation to find the capacitance.</li> </ol>
<b>Indicative Contents</b> المحتويات الإرشادية	<p>Indicative content includes the following:</p> <p><b>Vector algebra and coordinate systems</b> Vectors: Introduction, Vector components, Unit vector, Vector algebra (addition, subtraction, multiplication of vectors) Rectangular, Cylindrical and Spherical Coordinates [9 hrs]</p> <p><b>Electrical field</b> Electrical field intensity, Electric flux density, Gauss's law, Divergence theorem, Maxwell first equation [15 hrs]</p> <p><b>Potential</b> Potential Difference and Potential, The Potential Field of a Point Charge, The Potential Field of a System of Charges, Conservative Property, Potential Gradient, The Electric Dipole [6 hrs]</p> <p><b>Boundary Conditions</b> Continuity of Current, Metallic Conductors, Conductor Properties and Boundary Conditions Semiconductors, The Nature of Dielectric Materials, Boundary Conditions for Perfect Dielectric Materials [6 hrs]</p> <p><b>Capacitance</b> Capacitance Definition, Several Capacitance, examples, Poisson's and Laplace's equations, example of the solution of Poisson's and Laplace's equations. [9 hrs]</p>



## Learning and Teaching Strategies استراتيجيات التعلم والتعليم

<b>Strategies</b>	<p>The main strategy that will be adopted in introducing this unit is to encourage students to participate in the exercises, while at the same time improving and expanding their critical thinking skills. This will be achieved through interactive classes and tutorials and by reflecting on the origins and principles of physical theories. The module will include:</p> <ul style="list-style-type: none"> <li>- Lectures: To provide students with an overview of the main concepts and principles.</li> <li>- Assignments and Quizzes: To provide students with opportunities to apply their knowledge and skills to real-world problems and check their understanding.</li> </ul>
-------------------	---

## Student Workload (SWL) الحمل الدراسي للطلاب

Structured SWL (h/sem) الحمل الدراسي المنتظم للطلاب خلال الفصل	59	Structured SWL (h/w) الحمل الدراسي المنتظم للطلاب أسبوعياً	<b>3.9</b>
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطلاب خلال الفصل	66	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطلاب أسبوعياً	<b>4.4</b>
Total SWL (h/sem) الحمل الدراسي الكلي للطلاب خلال الفصل	125		

## Module Evaluation تقييم المادة الدراسية

		Time (hr)	Weight (Marks)	Week Due	Relevant Learning Outcome
<b>Formative assessment</b>	Quizzes	2	20% (20)	2,4,5,10	LO #2, 3, and 7
	Assignments	2	20% (20)	6, 13	LO # 5, and 9
<b>Summative assessment</b>	Midterm Exam	1.5hrs	10% (10)	8	LO # 1-7
	Final Exam	3hrs	50% (50)	16	All
<b>Total assessment</b>			100% (100 Marks)		

## Delivery Plan (Weekly Syllabus)

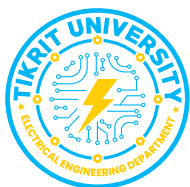
### المنهاج الاسبوعي النظري

	Material Covered
Week 1	General introduction about Electromagnetic theory Program
Week 2	Vectors: Introduction, Rectangular Coordinate, Vector components, Unit vector, Vector algebra (addition, subtraction, multiplication of vectors)
Week 3	Cylindrical and Spherical Coordinates.
Week 4	Electrical field; introduction, Coulomb's law, electrical field intensity, electrical field of point charges.
Week 5	Electric field of line charges, sheet charges, and continues distribution of volume charge
Week 6	Electric flux density, Gauss's law.
Week 7	Divergence theorem, Maxwell first equation.
Week 8	Midterm I exam
Week 9	Definition of Potential Difference and Potential, The Potential Field of a Point Charge,
Week 10	The Potential Field of a System of Charges, Conservative Property, Potential Gradient, The Electric Dipole
Week 11	Current and Current Density, Continuity of Current, Metallic Conductors, Conductor Properties and Boundary Conditions
Week 12	Semiconductors, The Nature of Dielectric Materials, Boundary Conditions for Perfect Dielectric Materials
Week 13	Capacitance Defined, Several Capacitance Examples,
Week 14	Poisson's and Laplace's Equations,
Week 15	Examples of the Solution of Laplace's Equation, Example of the Solution of Poisson's and Laplace's Equations.
Week 16	Final Examination.

## Learning and Teaching Resources

### مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Engineering Electromagnetics 8th Edition William H. Hayt, Jr.	YES
Recommended Texts	<ul style="list-style-type: none"> <li>• Elements of Electromagnetics-Sadiku- 3rd Edition</li> <li>• Schaum's Electromagnetics</li> </ul>	No
Websites	<a href="https://www.uu.se/en/admissions/freestanding-courses/course/?kKod=1FA252&amp;typ=1">https://www.uu.se/en/admissions/freestanding-courses/course/?kKod=1FA252&amp;typ=1</a>	



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	Electrical Networks		Module Delivery
Module Type	Core		Theory Lecture Lab Tutorial Practical Seminar
Module Code	Elec-215		
ECTS Credits	7		
SWL (hr/sem)	175		
Module Level	2	Semester (s) offered	
Administering Department	Electrical Engineering	College	Engineering
Module Leader	Saad Mohsen Hazzaa	e-mail	Saad.m.hazaa@ tu.edu.iq
Module Leader's Acad. Title	Lecturer	Module Leader's Qualification	MSc.
Module Tutor	Saad Mohsen Hazzaa	e-mail	Saad.m.hazaa@ 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	ENEC-1025	Semester	1&2
Co-requisites module	Engineering Mathematics	Semester	1

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

<b>Module Aims</b> أهداف المادة الدراسية	To develop students skills and teach them how to deal with electrical networks and their practical applications in daily life and the labor market. In this course students learn: <ol style="list-style-type: none"> <li>1. Understand balanced three-phase voltages and all types of connections.</li> <li>2. Understand and analyze balanced wye-wye connection circuits, balanced wye-delta connection circuits, balanced delta-delta connection circuits, balanced delta-wye connection circuits.</li> <li>3. Understand and analyze power in balanced three-phase circuits.</li> <li>4. Understand and analyze unbalanced three-phase circuits.</li> <li>5. Discrimination between line voltages and phase voltages, line currents and phase currents.</li> <li>6. Analyzing RC and RL circuits are of the first order differential equations.</li> <li>7. Understand the effect of natural response on first-order linear differential equations.</li> <li>8. Comprehend step response with its importance in solving linear differential equations.</li> <li>9. Understanding simple transient circuits with an inductor or a capacitor.</li> <li>10. Develop a better understanding of the solution of general second order differential equations.</li> <li>11. Learn how to determine initial and final values.</li> <li>12. Comprehend the response in source-free series RLC and parallel RLC circuits.</li> <li>13. Understand the step response of series RLC circuits and parallel RLC circuits.</li> <li>14. Analyzing and understanding the Magnetically Coupled Circuits</li> </ol>
<b>Module Learning Outcomes</b> مخرجات التعلم للمادة الدراسية	<ol style="list-style-type: none"> <li>1. To create engineers capable of solving the problems they face in the field of three-phase voltages, as they are commonly used in daily life.</li> <li>2. Distinguishing methods of connection between sources and loads.</li> <li>3. Analyzing electrical circuits based on first order differential equations.</li> <li>4. Analyzing electrical circuits based on second order differential equations.</li> <li>5. Understanding the Magnetically Coupled Circuits</li> </ol>
<b>Indicative Contents</b> المحتويات الإرشادية	Indicative content includes the following. <ol style="list-style-type: none"> <li>1. Three-Phase Circuits: [20hrs]</li> <li>2. First-Order Circuits:[15hrs]</li> <li>3. Second-Order Circuits: [15hrs]</li> <li>4. Magnetically Coupled Circuits:[9hrs]</li> </ol>

## Learning and Teaching Strategies استراتيجيات التعلم والتعليم

<b>Strategies</b>	The course includes the following topics; Types of connection in balanced and unbalanced three-phase circuits, as well as calculating the power, whether real or virtual. It also covers an important phenomenon in electrical circuits, which is the phenomenon of resonance, which depends on first order differential equations and second order differential equations for its analysis. Finally, magnetically coupled circuits.
-------------------	--



### Student Workload (SWL) الحمل الدراسي للطلاب

Structured SWL (h/sem) الحمل الدراسي المنتظم للطلاب خلال الفصل	87	Structured SWL (h/w) الحمل الدراسي المنتظم للطلاب أسبوعياً	5.8
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطلاب خلال الفصل	88	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطلاب أسبوعياً	5.86
Total SWL (h/sem) الحمل الدراسي الكلي للطلاب خلال الفصل	175		

### Module Evaluation تقييم المادة الدراسية

		Time (hr)	Weight (Marks)	Week Due	Relevant Learning Outcome
<b>Formative assessment</b>	Quizzes	3	15% (15)	5, 10, 13	LO #1, 2, 5, 6, 7, and 9
	Assignments	4	10% (10)	3, 6, 11, 14	LO # 3, 4, 6, 8 and 9
	Report	1	10% (10)	13	LO # 5, 6, 7 and 8
<b>Summative assessment</b>	Midterm Exam	2hrs	15% (15)	7	LO # 1-6
	Final Exam	3hrs	50% (50)	16	All
<b>Total assessment</b>			100% (100 Marks)		

## Delivery Plan (Weekly Syllabus)

### المنهاج الاسبوعي النظري

	Material Covered
Week 1	Senses of Engineering Ethics – Variety of moral issues – Types of inquiry – Moral dilemmas.
Week 2	Single-phase three wire system, Balanced three-phase voltages, and Balanced wye-wye circuits.
Week 3	Balanced wye-delta circuits, Balanced delta-delta circuits, Balanced delta-wye circuits.
Week 4	Power in balanced three-phase circuits, Unbalanced three-phase circuits, the Source-Free RC Circuit.
Week 5	The Source-Free RL Circuit, Step Response of an RC Circuit.
Week 6	Step Response of an RL Circuit.
Week 7	Finding Initial and Final Values, The Source-Free Series RLC Circuit
Week 8	Mid-term Exam + The Source-Free Parallel RLC Circuit.
Week 9	Step Response of a Series RLC Circuit.
Week 10	Step Response of a Parallel RLC Circuit.
Week 11	S-domain Circuits: Circuit Element Models.
Week 12	Circuit Analysis.
Week 13	Transfer Functions in s-domain.
Week 14	Frequency Response: Transfer Function, Series Resonance, Parallel Resonance. Passive Filters: Low-Pass Filter.
Week 15	High-Pass Filter, Band-Pass Filter and Band-Stop Filter.
Week 16	Preparatory week before the 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). ISBN-13: 978-0-13-376003-3, ISBN-10: 0-13-376003-0.	YES
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.	No
Websites		





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	Magnetic fields		Module Delivery
Module Type	Core		Theory Lecture Lab Tutorial Practical Seminar
Module Code	Elec-227		
ECTS Credits	5		
SWL (hr/sem)	125		
Module Level	UGxII 2	Semester (s) offered	
Administering Department	Electrical Engineering	College	Engineering
Module Leader	Qais K. Shaakir	e-mail	qshaakir@tu.edu. iq
Module Leader's Acad. Title	Assistant Lecturer	Module Leader's Qualification	MSc.
Module Tutor	Assistant Lecturer: Qais K. Shaakir	e-mail	qshaakir@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	ELEC-127	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

<b>Module Aims</b> أهداف المادة الدراسية	<ul style="list-style-type: none"> <li>• Identify the physical nature of the magnetic fields and its sources, then learn about the magnetic flux and its laws, especially ampere circuital law for flux density calculations.</li> <li>• Familiarize the student with methods for: calculating the magnetic field produced from different current distributions, finding the force and torque on a current element through the magnetic field, also the induced voltage due to variation with time of the magnetic field or due to conductor movement through the field</li> <li>• Learn about Maxwell's four equations for time-varying fields</li> <li>• Identify the wave propagation media, characteristics of each medium and wave propagation factors.</li> </ul>
<b>Module Learning Outcomes</b> مخرجات التعلم للمادة الدراسية	<ol style="list-style-type: none"> <li>1. Define the main laws of magnetic fields intensity</li> <li>2. Explain: Curl, Stokes' Theorem, Magnetic Flux and Magnetic Flux Density.</li> <li>3. Identify the Scalar and Vector Magnetic Potentials</li> <li>4. Identify the force on a different Current Elements.</li> <li>5. Discuss the magnetization and Permeability.</li> <li>6. Discuss Inductance and Mutual Inductance concept.</li> <li>7. Explain Faraday's Law, and displacement Current.</li> <li>8. Explain Maxwell's four equations for time varying fields.</li> <li>9. Identify the wave propagation factors</li> <li>10. Discuss wave propagation media, characteristics of each medium.</li> </ol>
<b>Indicative Contents</b> المحتويات الإرشادية	<p>Indicative content includes the following:</p> <p><b>Magnetic fields characteristics:</b> main laws of magnetic fields intensity, Curl, Stokes' Theorem, Magnetic Flux and Magnetic Flux Density.</p> <p><b>Magnetic Potentials</b> the Scalar and Vector Magnetic Potentials.</p> <p><b>Force, and inductance</b> the force on a different Current Elements, magnetization and Permeability, and Mutual Inductance concept.</p> <p><b>Induced emf</b> Faraday's Law, induced voltage and displacement Current.</p> <p><b>Maxwell's equations</b> Maxwell's four equations for time varying fields.</p> <p><b>Electromagnetic wave propagation</b> wave propagation factors, media, characteristics of each medium.</p>

## Learning and Teaching Strategies استراتيجيات التعلم والتعليم

<b>Strategies</b>	<p>The main strategy that will be adopted in introducing this unit is to encourage students to participate in the exercises, while at the same time improving and expanding their critical thinking skills. This will be achieved through interactive classes and tutorials and by reflecting on the origins and principles of physical theories. The module will include:</p> <ul style="list-style-type: none"> <li>- Lectures: To provide students with an overview of the main concepts and principles.</li> <li>- Assignments and Quizzes: To provide students with opportunities to apply their knowledge and skills to real-world problems and check their understanding.</li> </ul>
-------------------	---



Student Workload (SWL) الحمل الدراسي للطلاب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطلاب خلال الفصل	59	Structured SWL (h/w) الحمل الدراسي المنتظم للطلاب أسبوعياً	3.9
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطلاب خلال الفصل	66	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطلاب أسبوعياً	4.4
Total SWL (h/sem) الحمل الدراسي الكلي للطلاب خلال الفصل	125		

Module Evaluation تقييم المادة الدراسية					
		Time (hr)	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	4	20% (20)	2,4, 12,14	LO #2, 4, 7and 10
	Assignments	2	20% (20)	6, 13	LO # 5, and 8
Summative assessment	Midterm Exam	1.5hrs	10% (10)	8	LO # 1-7
	Final Exam	3hrs	50% (50)	16	All
Total assessment			100% (100 Marks)		

## Delivery Plan (Weekly Syllabus)

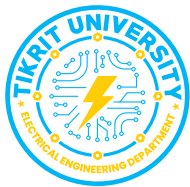
### المنهاج الاسبوعي النظري

	Material Covered
Week 1	ENGINEERING ETHICS: Self-interest – Customs and Religion – Uses of Ethical Theories. Biot-Savart Law, Ampère's Circuital Law
Week 2	Curl, Stokes' Theorem, Magnetic Flux and Magnetic Flux Density
Week 3	The Scalar and Vector Magnetic Potentials, Derivation of the Steady-Magnetic-Field Laws
Week 4	Force on a Moving Charge, Force on a Differential Current Element
Week 5	Force between Differential Current Elements, Force and Torque on a Closed Circuit
Week 6	Magnetization and Permeability
Week 7	General Revision
Week 8	midterm examination
Week 9	Magnetic Boundary Conditions, The Magnetic Circuit
Week 10	Potential Energy and Forces on Magnetic Materials
Week 11	Inductance and Mutual Inductance
Week 12	Faraday's Law, Displacement Current
Week 13	Maxwell's Equations in Point Form, Maxwell's Equations in Integral Form
Week 14	Wave Propagation in Free Space, Wave Propagation in Dielectrics
Week 15	General Revision
Week 16	Final examination

## Learning and Teaching Resources

### مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Engineering Electromagnetics 8th Edition William H. Hayt, Jr.	YES
Recommended Texts	<ul style="list-style-type: none"> <li>• Elements of Electromagnetics-Sadiku- 3rd Edition</li> <li>• Schaum's Electromagnetics</li> </ul>	No
Websites	<a href="https://www.uu.se/en/admissions/freestanding-courses/course/?kKod=1FA252&amp;typ=1">https://www.uu.se/en/admissions/freestanding-courses/course/?kKod=1FA252&amp;typ=1</a>	



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	Basic of Electronic		Module Delivery
Module Type	Core		Theory Lecture Tutorial lab
Module Code	Elec-214		
ECTS Credits	5		
SWL (hr/sem)	125		
Module Level	2	Semester (s) offered	1
Administering Department	Electrical Engineering	College	Engineering
Module Leader	Omer N. Mahmmoud	e-mail	omer.n.mahm- moud@tu.edu.iq
Module Leader's Acad. Title	Assistant Lecturer	Module Leader's Qualification	MSc.
Module Tutor	Omer N. Mahmmoud	e-mail	omer.n.mahm- moud@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	ELEC-115	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

<b>Module Aims</b> أهداف المادة الدراسية	In this course, students learn Rectification, Clipping, Clamping, Voltage Multipliers, Logic Elements, Zener Diode Characteristics and Applications. BJT : Construction, Operation, Configurations and Characteristics, Operating Regions, Load–Lines, The Transistor as an Amplifier, DC Biasing Circuits and Stability, Power Dissipation, Switching Transistors, The BJT Inverter. BJT Small–Signal Analysis: Transistor Equivalent Circuits, Voltage and Current Gain, Input and Output Impedance, Low and High Frequency Operation.
<b>Module Learning Outcomes</b> مخرجات التعلم للمادة الدراسية	<ol style="list-style-type: none"> <li>1. Demonstrate knowledge and understanding of basic electronic components.</li> <li>2. Analyze and understand the behavior of any electronic circuit or device.</li> <li>3. Design of electronic and electrical systems.</li> <li>4. Planning and implementing applied electronic activities, evaluating results and drawing applicable results.</li> </ol>
<b>Indicative Contents</b> المحتويات الإرشادية	Indicative content includes the following. <ol style="list-style-type: none"> <li>1. Introduction to the diode, rectification, clipping, clamping , Zener Diode (15 hrs)</li> <li>2. Bipolar Transistor Circuits (BJT) : Construction, operation, configurations and characteristics, operating regions, load–lines, the transistor as an amplifier, dc biasing circuits and stability, power dissipation, switching transistors, the bjt inverter (25 hrs)</li> <li>3. BJT Small–Signal Analysis: Transistor Equivalent Circuits, Voltage and Current Gain, Input and Output Impedance, Low and High Frequency Operation. (25 hrs)</li> </ol>
<b>Course Description</b>	This course aims to establish fundamental knowledge of introduction to diode, rectification, clipping, clamping, Zener Diode. Presentation of the Bipolar Transistor Circuits (BJT): Construction, operation, configurations and characteristics, operating regions, load lines, the transistor as an amplifier, dc biasing circuits and stability, power dissipation, switching transistors, the BJT inverter. BJT Small–Signal Analysis: Transistor equivalent circuits, voltage and current gain, input and output impedance, low and high frequency operation.

## Learning and Teaching Strategies استراتيجيات التعلم والتعليم

<b>Strategies</b>	The learning and teaching strategy is planned in order to provide sufficient information to study electronic components, including semiconductors, and to demonstrate concepts with appropriate (and practical where possible) examples that allow students sufficient time to practice and apply techniques using a large number of carefully selected educational electronic components.
-------------------	--



### Student Workload (SWL) الحمل الدراسي للطلاب

Structured SWL (h/sem) الحمل الدراسي المنتظم للطلاب خلال الفصل In class lectures 65 In class tests 5 Seminars 5	74	Structured SWL (h/w) الحمل الدراسي المنتظم للطلاب أسبوعياً	4.9
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطلاب خلال الفصل Library, dorm, home memorizing 65 Preparation for tests 35 Homeworks 20	51	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطلاب أسبوعياً	3.4
Total SWL (h/sem) الحمل الدراسي الكلي للطلاب خلال الفصل	125		

### Module Evaluation تقييم المادة الدراسية

		Time (hr)	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	15% (10)	5, 7, 10, 13	LO #1, 2, and 6
	Assignments	6	10% (18)	5, 7, 9, 10, 13, 15	LO # 4, 5 and 6
	Lab	3	15% (12)	Continuous	
Summative assessment	Midterm Exam	2hrs	10% (10)	8	LO # 1-5
	Final Exam	3hrs	50% (50)	16	All
Total assessment			100% (100 Marks)		

### Learning and Teaching Resources مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	"Electronic Devices & 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	ELECTRONIC DEVICES by Thomas L. Floyd, Ninth Edition, 2012.	No
Websites	<a href="http://www.pearsonhighered.com/electronics">http://www.pearsonhighered.com/electronics</a>	

## Delivery Plan (Weekly Syllabus)

### المنهاج الاسبوعي النظري

	Material Covered
Week 1	ENGINEERING ETHICS Moral Autonomy – Kohlberg’s theory – Gilligan’s theory.
Week 2	Introduction to the diode, Diode Circuit Applications: Clipping, Clamping, Voltage Multipliers, Logic Elements
Week 3	Introduction to the Zener Diode
Week 4	Zener Diode Characteristics and Applications.
Week 5	Introduction to the Bipolar Transistor Circuits (BJT)
Week 6	BJT : construction, operation, configurations and characteristics
Week 7	The Transistor as an Amplifier
Week 8	Midterm exam
Week 9	DC biasing circuits
Week 10	Stability, power dissipation, switching transistors, the BJT inverter
Week 11	BJT Small-Signal Analysis: Transistor equivalent circuits
Week 12	Voltage and current gain, input and output impedance
Week 13	analysis of CE, CC , and CB configurations
Week 14	BJT as a switch, current sources using BJTs
Week 15	Low and high frequency operation
Week 16	Final Exam

## Delivery Plan (Weekly Syllabus)

### المنهاج الاسبوعي النظري

	Material Covered
Week 1	Lab 1: diode rectifier circuits (half wave and full wave)
Week 2	Lab 2: diode ( clipper clamper)
Week 3	Lab 3: Zener diode
Week 4	Lab 4: characteristic of BJT
Week 5	Lab 5: DC biasing of bipolar junction transistor
Week 6	Lab 6: Basic amplifier circuit with BJT
Week 7	Lab 7:Final tests





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	FUNDAMENTAL OF Electronic DEVICES		Module Delivery
Module Type	Core		Theory Lecture Tutorial lab
Module Code	Elec-224		
ECTS Credits	5		
SWL (hr/sem)	125		
Module Level	2	Semester (s) offered	2
Administering Department	Electrical Engineering	College	Engineering
Module Leader	Omer N. Mahmmoud	e-mail	omer.n.mahm- moud@tu.edu.iq
Module Leader's Acad. Title	Assistant Lecturer	Module Leader's Qualification	MSc.
Module Tutor	Omer N. Mahmmoud	e-mail	omer.n.mahm- moud@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	ELEC-214	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

<b>Module Aims</b> أهداف المادة الدراسية	In this course, students learn Field Effect Transistors (FET). FET: Junction field-effect transistor (JFET): physical operation and static characteristics. - Metal - Oxide semiconductor FET (MOSFET): depletion -type MOSFET, enhancement - type MOFET. DC analysis of FET , the FET as an amplifier, graphical (load line ) analysis, small-single FET models, analysis of CS , CD and CG configurations , using FETs as switch , voltage variable resistor , and constant current source. Multistage Amplifiers: Analysis of multistage amplifiers (voltage gain, current gain. etc.). Types of multistage amplifiers (cascade ... etc.). RC-Coupled BJT Amplifier, Direct- Coupled BJT Amplifiers, Frequency Response, Multistage FET Amplifiers, Transformer Coupling. Introduction to four layer Description and operation of silicon controlled rectifier, DIAC, GTO and TRIAC.
<b>Module Learning Outcomes</b> مخرجات التعلم للمادة الدراسية	<ol style="list-style-type: none"> <li>1. Demonstrate knowledge and understanding of basic electronic components.</li> <li>2. Analyze and understand the behavior of any electronic circuit or device.</li> <li>3. Design of electronic and electrical systems.</li> <li>4. Planning and implementing applied electronic activities, evaluating results and drawing applicable results.</li> </ol>
<b>Indicative Contents</b> المحتويات الإرشادية	<p>Indicative content includes the following.</p> <ol style="list-style-type: none"> <li>1- Field Effect Transistors (FET). FET: Junction field-effect transistor (JFET): physical operation and static characteristics. - Metal - Oxide semiconductor FET (MOSFET): depletion -type MOSFET, enhancement - type MOFET. - DC analysis of FET, the FET as an amplifier, graphical (load line) analysis (20 hrs.)</li> <li>2- small-single FET models, analysis of CS , CD and CG configurations , using FETs as switch , voltage variable resistor , and constant current source (20 hrs.)</li> <li>3- Multistage Amplifiers: Analysis of multistage amplifiers (voltage gain, current gain. etc.). Types of multistage amplifiers (cascade ... etc.). RC-Coupled BJT Amplifier, Direct- Coupled BJT Amplifiers, Frequency Response, Multistage FET Amplifiers, Transformer Coupling (15 hrs.).</li> <li>4- Introduction to four layer Description and operation of silicon controlled rectifier, DIAC, GTO and TRIAC (10 hrs.)</li> </ol>
<b>Course Description</b>	This course aims to establish fundamental knowledge of Field Effect Transistors (FET). FET: Junction field-effect transistor (JFET): physical operation and static characteristics. - Metal - Oxide semiconductor FET (MOSFET): depletion -type MOSFET, enhancement - type MOFET. DC analysis of FET , the FET as an amplifier, graphical (load line ) analysis, small-single FET models, analysis of CS , CD and CG configurations , using FETs as switch , voltage variable resistor , and constant current source. Multistage Amplifiers: Analysis of multistage amplifiers (voltage gain, current gain. etc.). Types of multistage amplifiers (cascade ... etc.). RC-Coupled BJT Amplifier, Direct- Coupled BJT Amplifiers, Frequency Response, Multistage FET Amplifiers, Transformer Coupling. Introduction to four layer Description and operation of silicon controlled rectifier, DIAC, GTO and TRIAC.

## Learning and Teaching Strategies استراتيجيات التعلم والتعليم

<b>Strategies</b>	The learning and teaching strategy is planned in order to provide sufficient information to study electronic components, including semiconductors, and to demonstrate concepts with appropriate (and practical where possible) examples that allow students sufficient time to practice and apply techniques using a large number of carefully selected educational electronic components.
-------------------	--



### Student Workload (SWL) الحمل الدراسي للطلاب

Structured SWL (h/sem) الحمل الدراسي المنتظم للطلاب خلال الفصل In class lectures                   65 In class tests                           5 Seminars                                 5	74	Structured SWL (h/w) الحمل الدراسي المنتظم للطلاب أسبوعياً	4.9
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطلاب خلال الفصل Library, dorm, home memorizing   65 Preparation for tests                 35 Homeworks                             20	51	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطلاب أسبوعياً	3.4
Total SWL (h/sem) الحمل الدراسي الكلي للطلاب خلال الفصل	125		

### Module Evaluation تقييم المادة الدراسية

		Time (hr)	Weight (Marks)	Week Due	Relevant Learning Outcome
<b>Formative assessment</b>	Quizzes	2	15% (10)	5, 7, 10, 13	LO #1, 2, and 6
	Assignments	6	10% (18)	5, 7, 9, 10, 13, 15	LO # 4, 5 and 6
	Lab	3	15% (12)	Continuous	
<b>Summative assessment</b>	Midterm Exam	2hrs	10% (10)	8	LO # 1-5
	Final Exam	3hrs	50% (50)	16	All
<b>Total assessment</b>			100% (100 Marks)		

### Learning and Teaching Resources مصادر التعلم والتدريس

	Text	Available in the Library?
<b>Required Texts</b>	"Electronic Devices & 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
<b>Recommended Texts</b>	ELECTRONIC DEVICES by Thomas L. Floyd, Ninth Edition, 2012.	Yes
<b>Websites</b>	<a href="http://www.pearsonhighered.com/electronics">http://www.pearsonhighered.com/electronics</a>	

## Delivery Plan (Weekly Syllabus)

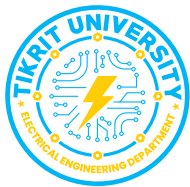
### المنهاج الاسبوعي النظري

	Material Covered
Week 1	ENGINEERING ETHICS: Consensus and Controversy – Models of professional roles – Theories about right action. Introduction to the Field Effect Transistors (FET).
Week 2	Junction field-effect transistor (JFET): physical operation and static characteristics
Week 3	Physical operation and static characteristics. – Metal - Oxide semiconductor FET (MOSFET): depletion -type MOSFET, enhancement - type MOSFET.
Week 4	DC analysis of FET
Week 5	The FET as an amplifier.
Week 6	Graphical (load line ) analysis
Week 7	Small-single FET models
Week 8	Midterm exam
Week 9	Analysis of CS , CD and CG configurations
Week 10	Using FETs as switch, voltage variable resistor, and constant current source.
Week 11	Multistage Amplifiers: Analysis of multistage amplifiers (voltage gain, current gain. etc.).
Week 12	Types of multistage amplifiers (cascade ... etc.). RC-Coupled BJT Amplifier, Direct- Coupled BJT Amplifiers, Frequency Response
Week 13	Multistage FET Amplifiers, Transformer Coupling
Week 14	Introduction to four layer Description and operation of silicon controlled rectifier
Week 15	DIAC, GTO and TRIAC.
Week 16	Final Exam

## Delivery Plan (Weekly Syllabus)

### المنهاج الاسبوعي النظري

	Material Covered
Week 1	Lab 1: Unipolar junction Field Effect Transistors (FET).
Week 2	Lab 2: The FET transfer characteristics curve
Week 3	Lab 3: small signal FET common drain amplifier
Week 4	Lab 4: small signal FET common source amplifier
Week 5	Lab 5: Multistage FET Amplifiers
Week 6	Lab 6: Multistage BJT Amplifiers
Week 7	Lab 7: Final tests



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	Logic Circuits		Module Delivery
Module Type	Core		Theory Lecture Lab Tutorial Practical Seminar
Module Code	Elec-212		
ECTS Credits	4		
SWL (hr/sem)	100		
Module Level	1	Semester (s) offered	
Administering Department	Electrical Engineering	College	Engineering
Module Leader	Dr. MOHAMMED KAMIL	e-mail	mohamedkamil@ tu.edu.iq
Module Leader's Acad. Title	Lecturer	Module Leader's Qualification	Ph.D.
Module Tutor	Dr. MOHAMMED KAMIL	e-mail	mohamedkamil@ 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	ELEC-112	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

<b>Module Aims</b> أهداف المادة الدراسية	The aim of this class is an introduction to the basic concepts, analysis, and design of logic circuits, this consists of both combinational and sequential logic. Lectures will enable students to experience with several levels of digital systems.
<b>Module Learning Outcomes</b> مخرجات التعلم للمادة الدراسية	At Completing of this module, the student should be able to: 1. analyze and understand the behavior of combinational and sequential digital circuits. 2. design and implement combinational and sequential logic circuits. 3. understand various combinational "building blocks" such as decoders, multiplexers, and encoders. 4. design and implement arithmetic logic circuits. 5. understand the behavior exhibited by latches and flip-flops. 6. understand of various sequential "building blocks" such as counters and shift registers
<b>Indicative Contents</b> المحتويات الإرشادية	1. Combinational Logic Analysis 2. Functions of Combinational Logic 3. Latches and Flip-Flops 4. Counters. 5. Shift Registers
<b>Course Description</b>	Design and implementation of combinational and sequential logic circuits. Concepts of Boolean algebra, Karnaugh maps, flip-flops, registers, and counters along with various logic families and comparison of their behavior and characteristics.

## Learning and Teaching Strategies استراتيجيات التعلم والتعليم

<b>Strategies</b>	The module will use a range of learning and teaching strategies, including: - <b>Lectures:</b> To provide students with an overview of the main concepts and principles. - <b>Labs:</b> To provide students with hands-on experience of Design and implement variety of logical devices using combinational circuits concepts. - <b>Assignments:</b> To provide students with opportunities to apply their knowledge and skills to real-world problems.
-------------------	--



### Student Workload (SWL) الحمل الدراسي للطلاب

Structured SWL (h/sem) الحمل الدراسي المنتظم للطلاب خلال الفصل	60	Structured SWL (h/w) الحمل الدراسي المنتظم للطلاب أسبوعياً	4
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطلاب خلال الفصل Library, dorm, home memorizing 35 Preparation for tests 20 Homeworks 20	40	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطلاب أسبوعياً	2.6
Total SWL (h/sem) الحمل الدراسي الكلي للطلاب خلال الفصل	100		

### Module Evaluation تقييم المادة الدراسية

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

### Learning and Teaching Resources مصادر التعلم والتدريس

	Text	Available in the Library?
<b>Required Texts</b>	Digital Fundamentals 11th edition, by: Thomas L. Floyd	Yes
<b>Recommended Texts</b>	Digital Design 6th edition, by: M. Morris Mano	No
<b>Websites</b>		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Basic concepts, Implementing Combinational Logic
Week 2	Universal Property of NAND and NOR gates
Week 3	Combinational Logic Using NAND and NOR gates.
Week 4	Basic Adders, Parallel Binary adder
Week 5	Comparators, Decoders, Encoders
Week 6	Multiplexers, Demultiplexes.
Week 7	Midterm I exam
Week 8	Latches, Edge-Triggered Flip-Flops
Week 9	Flip-Flop operating Characteristics
Week 10	Flip-Flop Applications
Week 11	Asynchronous counters
Week 12	Synchronous counters
Week 13	Up/Down counters, Counter applications
Week 14	Shift register operations
Week 15	Shift Registers Applications
Week 16	Final Exam

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Lab 1: Design and realization of Half and Full adder.
Week 2	Lab 2: Design and realization of Decoder and Encoder.
Week 3	Lab 3: Design and realization of Comparator and Multiplexor.
Week 4	Lab 4: Realization of S-R and J-K Flip Flops.
Week 5	Lab 5: Realization of T and D Flip Flops.
Week 6	Lab 6: Design and realization of counters.
Week 7	Lab 7: Realization of Shift Registers.





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	DC MACHINES and Transformers		Module Delivery
Module Type	Core		Lecture Lab Tutorial
Module Code	Elec-226		
ECTS Credits	8		
SWL (hr/sem)	200		
Module Level	2	Semester (s) offered	2
Administering Department	Electrical Engineering	College	Engineering
Module Leader	Dr. Thamir Hassan Atyia	e-mail	dr.thamir.atyia@tu.edu.iq
Module Leader's Acad. Title	Assistant Professor	Module Leader's Qualification	Ph.D.
Module Tutor	None	e-mail	None
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	ELEC-121	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

<b>Module Aims</b> أهداف المادة الدراسية	The module introduces students to the fundamental principles of electric and magnetic fields at low frequencies and provides an overview of the working principles of transformers and DC electrical machines. Learn the construction of dc machine, and enhance the students' skills for the principles of commutation and armature reaction. Then they learn various types of dc machines including characteristics Subject content aims: <ul style="list-style-type: none"> <li>• To introduce students to the main parameters and properties of electric and magnetic fields at low frequencies.</li> <li>• To introduce students to the principles of electro-mechanics and electromechanical energy conversion to show how electromagnetic fields can be used to induce forces and torques on current carrying conductors.</li> <li>• To introduce students to the basics of electrical machine construction and the structure and operational principles of DC machines.</li> <li>• To introduce students to the concept of magnetic circuits and the operational principles and characteristics of transformers.</li> <li>• Graduate skills aims:</li> <li>• To develop skills in basic numerical and analytical techniques.</li> <li>• To develop professional laboratory working practices.</li> </ul>
<b>Module Learning Outcomes</b> مخرجات التعلم للمادة الدراسية	5. Understand and use Ampere's Law to calculate the flux in simple types of magnetic circuits with and without air gaps, so as to be able to analyze magnetic circuits using the concepts of magneto motive force and magnetic reluctance. 6. Understand and be able to state Faraday's Law and know that the induced EMF in a coil is proportional to the rate of change of magnetic flux through that coil. 7. Demonstrate an understanding of the relations between flux linkage, inductance and energy. 8. Understand the concept of mutual inductance and for a two winding transformer be able to draw the equivalent circuit and calculate the voltage, current and impedance ratio. 9. Demonstrate an understanding of how magnetic fields induce a force on a current carrying coil and be able to calculate the torque on such a coil. 10. Demonstrate an understanding of basic electrical machine construction and terminology and be able to explain the operation of a DC machine.
<b>Indicative Contents</b> المحتويات الإرشادية	Indicative content includes the following. <ul style="list-style-type: none"> <li>• Basic principles of electromagnetic machines. Direct Current Generators and Motors (6 hrs)</li> <li>• Types and characteristics of DC Electrical Machines and Transformers (12 hrs)</li> <li>• Ideal and practical transformers and their circuit models (12 hrs)</li> <li>• Evaluate the design and efficiency of electrical machines (9 hrs)</li> <li>• Apply mathematical principles to solve analytical problems on electrical machines (15 hrs)</li> </ul>
<b>Course Description</b>	This course aims to introduce the student to establish fundamental knowledge of the main technologies for the generation and transformation of electrical power with an emphasis on their operating principles, their stability when interconnected and techniques for their control.

## Learning and Teaching Strategies استراتيجيات التعلم والتعليم

<b>Strategies</b>	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 للطلاب

Structured SWL (h/sem) الحمل الدراسي المنتظم للطلاب خلال الفصل In class lectures In class tutorials In class tests Seminars	116	Structured SWL (h/w) الحمل الدراسي المنتظم للطلاب أسبوعياً	7.73
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطلاب خلال الفصل Library, dorm, home memorizing Preparation for tests Homeworks	84	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطلاب أسبوعياً	5.6
Total SWL (h/sem) الحمل الدراسي الكلي للطلاب خلال الفصل		100	

## Module Evaluation تقييم المادة الدراسية

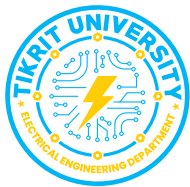
		Time (hr)	Weight (Marks)	Week Due	Relevant Learning Outcome
<b>Formative assessment</b>	Quizzes	3	15% (10)	5, 10, 13	LO #1, 2, 3, and 4
	Assignments	4	8% (10)	3,6, 11,14	LO # 1, 2, 3, 4, 5 and 6
	Lab	1	12% (10)	Continuous	
	Report	1	5% (10)	13	LO # 1, 2, 5 and 6
<b>Summative assessment</b>	Midterm Exam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

## Learning and Teaching Resources مصادر التعلم والتدريس

	Text	Available in the Library?
<b>Required Texts</b>	Electrical Machinery Fundamentals, Stephen J Chapmans, 4th edition, MicGraw Hill, 2005	Yes
<b>Recommended Texts</b>	2-Electrical Machines, D. P. Kothari and I. J. Nagrath, 4th edition, MicGraw Hill, 2010	No
<b>Websites</b>		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Principle operation of DC motors
Week 2	DC motors torque equation
Week 3	Types and Characteristics of DC motors
Week 4	Speed control of DC motors
Week 5	Starting of DC motors
Week 6	Efficiency and maximum power of DC motors
Week 7	Midterm exam
Week 8	Operating and construction of Transformers
Week 9	Single phase transformers
Week 10	Open and short circuit of transformers
Week 11	Three phase transformers
Week 12	Parallel operation of transformers
Week 13	Losses and efficiency of transformers
Week 14	Auto-transformers and voltage regulation of transformers
Week 15	Round up
Week 16	Final Exam

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Lab 1: DC Shunt Motor speed control
Week 2	Lab 2: DC Series Motor speed control
Week 3	Lab 3: DC Compound Motor speed control
Week 4	Lab 4: DC Separately excited Motor speed control
Week 5	Lab 5: Single phase transformer (Open-circuit test)
Week 6	Lab 6: Design and realization of counters.



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	Engineering mathematics		Module Delivery
Module Type	Core		Theory Lecture Lab Tutorial Practical Seminar
Module Code	Elec-221		
ECTS Credits	5		
SWL (hr/sem)	125		
Module Level	2	Semester (s) offered	1
Administering Department	Electrical Engineering	College	Engineering
Module Leader	Abdulmuttalib. A. Hussein	e-mail	abdulmuttalib.a.hussein@tu.edu.iq
Module Leader's Acad. Title		Module Leader's Qualification	
Module Tutor	Abdulmuttalib. A. Hussein	e-mail	abdulmuttalib.a.hussein@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	MATH-201	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	<p>2- Develop an understanding of different mathematical methods used to model engineering applications</p> <p>3- Ability to implement and solve mathematical models for engineering problems</p>
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	<p>On completion of this course students will be able to:</p> <p>5- Identify, formulate, and solve engineering problems.</p> <p>6- Use mathematical and analytical tools to solve engineering problems.</p> <p>7- Communicate effectively about engineering problems.</p> <p>8- Work effectively in teams on engineering projects.</p> <p>9- Apply engineering principles to real-world problems.</p>
Indicative Contents المحتويات الإرشادية	<p>Indicative content includes the following.</p> <ul style="list-style-type: none"> <li>• First Order Ordinary Differential Equations (10hrs)</li> <li>• Second Ordinary Differential Equations (10hrs)</li> <li>• Simultaneous Linear Differential Equations (10hrs)</li> <li>• Laplace Transform: (15hrs)</li> <li>• Fourier Series (15hrs)</li> <li>• Partial Differential Equations (15hrs)</li> </ul>
Course Description	<p>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.</p>

## Learning and Teaching Strategies استراتيجيات التعلم والتعليم

Strategies	<p>1- 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.</p> <p>2- 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.</p> <p>3- 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.</p>
------------	--



### Student Workload (SWL) الحمل الدراسي للطلاب

Structured SWL (h/sem) الحمل الدراسي المنتظم للطلاب خلال الفصل In class lectures 75 In class tests 3	59	Structured SWL (h/w) الحمل الدراسي المنتظم للطلاب أسبوعياً	3.9
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطلاب خلال الفصل Library, dorm, home memorizing 25 Preparation for tests 27 HomeWorks 20	66	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطلاب أسبوعياً	4.4
Total SWL (h/sem) الحمل الدراسي الكلي للطلاب خلال الفصل	125		

### Module Evaluation تقييم المادة الدراسية

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

## Delivery Plan (Weekly Syllabus)

### المنهاج الاسبوعي النظري

	Material Covered
Week 1	First Order Ordinary Differential Equations: Separable Equations
Week 2	First Order Ordinary Differential Equations: Linear Equations; Exact Equations
Week 3	Second Ordinary Differential Equations: Homogeneous; Non- Homogeneous
Week 4	Second Ordinary Differential Equations: The Euler Cauchy Differential Equations; Power Series Solutions
Week 5	Simultaneous Linear Differential Equations
Week 6	Simultaneous Linear Differential Equations
Week 7	Special Functions: Gamma Function
Week 8	Special Functions: Euler Beta Function
Week 9	Laplace Transform: - The General Method - The Transform of Special Functions
Week 10	Laplace Transform: - The Shifting Theorems - The Differentiation and Integration of Transforms - Solving Differential Equations by Laplace Transform
Week 11	Fourier Series - The Euler Formulas - Half Range Expansion
Week 12	Fourier Transform - Properties of Fourier Transform - Solving Differential Equations by Fourier Transform
Week 13	Orthogonality Properties of Sine and Cosine
Week 14	Partial Differential Equations - Separation of Variables (Heat Equations)
Week 15	Partial Differential Equations - Separation of Variables (Wave Equations)
Week 16	Final Exam

## Learning and Teaching Resources

### مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Advanced Engineering Analysis C. Ray Wylie.	Yes
Recommended Texts	Advanced Engineering Mathematics, 5th ed., D.G. Zill and M.R. Cullen. Advanced Engineering Analysis, 10th ed., Erwin K.	Yes
Websites		





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	حقوق الانسان والديمقراطية		Module Delivery
Module Type	غير أساسية داعمة		محاضرات نظرية
Module Code	ELEC-112		
ECTS Credits	2		
SWL (hr/sem)	50		
Module Level	1	Semester (s) offered	1
Administering Department	Environment Engineering	College	Engineering
Module Leader	Sabah Mahdi Salih	e-mail	sabahmahdi@ tu.edu.iq
Module Leader's Acad. Title	Assistant Professor	Module Leader's Qualification	Msc.
Module Tutor	None	e-mail	None
Peer Reviewer Name	Ahmed Hussein khunfas	e-mail	ahmed.husain@ tu.edu.iq
Review Committee Approval	01/06/2023	Version Number	1.0

## Relation With Other Modules العلاقة مع المواد الدراسية الأخرى

Prerequisite module	لا يوجد	Semester	1
Co-requisites module	لا يوجد	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	<p>القدرة على ادراك المفهوم الاساسي لحقوق الانسان والطفل والديمقراطية- القدرة على فهم الاصول التاريخية للمفهومين. ومعرفة ايجابيات وسلبيات حقوق الانسان والديمقراطية - الاطلاع على حقوق الانسان والطفل والديمقراطية في الاسلام - التعرف على مصادر حقوق الانسان والطفل وخصائص وسمات الديمقراطية - معرفة اثر التطور التكنولوجي على حقوق الانسان والطفل والديمقراطية— التطرق لمفاهيم ذات صلة بالمصطلحين مثل ( العولمة، مؤسسات المجتمع المدني ، الانتخابات والاستفتاء ، الحكم- (الرشيد ، الجرائم الانسانية، الدستور الاطلاع على الضمانات التي تكفل حقوق الانسان والطفل وتكفل النظام الديمقراطي والحقوق والحرريات العامة-</p>
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	<p>التعرف على المصطلحات ذات الصلة بمفهوم حقوق الانسان والطفل والديمقراطية التعرف على اهم الحقوق التي كفلها الإسلام للإنسان والطفل واستثمارها في معالجة الآفات والحالات السلبية التي تغزو المجتمعات في العصر الحالي الاستفادة من مزايا الديمقراطية ومكوناتها في معالجة التذبذب وعدم الاستقرار في المجتمع والحفاظ على الاستقرار والسلم المجتمعي الاطلاع على المواثيق الدولية المختصة بمجالات حقوق الانسان والطفل الصادرة عن المنظمات الدولية وجمعية الأمم المتحدة (الاستفادة من تجارب الآخرين (الدول المتقدمة في مجالات حقوق الانسان والطفل والديمقراطية الامام بالقوانين والدساتير الدولية والإقليمية والمحلية المختصة بقضايا حقوق الانسان والحرريات العامة والديمقراطية التعرف على جرائم الإبادة الجماعية والجرائم الإنسانية ومدى تأثيرها على مفهوم حقوق الانسان والطفل والديمقراطية</p>
Indicative Contents المحتويات الإرشادية	<p>يتضمن المحتوى الإرشادي ما يأتي حقوق الانسان والطفل والديمقراطية في الحضارات القديمة والإسلام 8 ساعات مصادر حقوق الانسان العالمية والمحلية، خصائص وسمات الديمقراطية 4 ساعات ضمانات حقوق الانسان العالمية والمحلية وضمانات النظام الديمقراطي 4 ساعات حقوق الانسان والطفل والديمقراطية واثر التقدم التكنولوجي عليهما 4 ساعات العولمة ، مؤسسات المجتمع المدني ، الانتخابات والاستفتاء، الدستور 4 ساعات الجرائم الإنسانية وانواعها ، الحكم الرشيد ، 2 ساعة الوثائق الدولية الخاصة بحقوق الطفل والديمقراطية المعاصرة 4 ساعات</p>
Course Description	<p>حقوق الانسان: هي حقوق يتمتع بها جميع مكونات البشر لمجرد اننا من ابناء البشر، وهذه الحقوق متأصلة في جميع البشر مهما كان عرقهم او جنسهم او قوميتهم او مذهبهم ولا تمنح من أي دولة، وتتضمن حقوق الانسان والطفل في الحضارات القديمة والاسلام، المواثيق الدولية ، مصادر وضمانات حقوق الانسان ، القوانين والدساتير، مجلس حقوق الانسان، العولمة، التقدم التكنولوجي واثره على حقوق الانسان</p> <p>الديمقراطية: يرجع مصطلح الديمقراطية الى الحضارة اليونانية القديمة وهي عبارة عن مصطلح مكون من مقطعين التي تعني الشعب ليصبح المفهوم حكم الشعب ، وتتضمن (( Demo التي تعني حكم و Cratia)) هما الديمقراطية التطرق الى مفهومها ومعرفة الجذور التاريخية لها ، المكونات ، الخصائص ، المميزات ، الضمانات ، علاقة الديمقراطية ب ( الدستور ، مؤسسات المجتمع المدني ، حقوق الانسان ، الحكم الرشيد، الانتخابات) ، الديمقراطية المعاصرة</p>

## Learning and Teaching Strategies استراتيجيات التعلم والتعليم

Strategies	<p>تم وضع استراتيجيات التعلم والتعليم من اجل ان يحصل الطالب على معلومات كاملة تغطي المنهج الدراسي المعد للمادة ولكي تتحقق الغاية الاساسية للمنهج الذي ينصب نحو الامام وادراك الطالب بالمفاهيم الاساسية لحقوق الانسان والديمقراطية ، والاطلاع على المصادر والضمانات والمواثيق الدولية للمصطلحين من اجل استثمارها في معالجة الظواهر السلبية في المجتمع والحفاظ على الاستقرار والسلم المجتمعي</p>
------------	--



### Student Workload (SWL) الحمل الدراسي للطلاب

Structured SWL (h/sem) الحمل الدراسي المنتظم للطلاب خلال الفصل In class lectures 27 In class tests 3	30	Structured SWL (h/w) الحمل الدراسي المنتظم للطلاب أسبوعياً	2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطلاب خلال الفصل	20	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطلاب أسبوعياً	1.3
Total SWL (h/sem) الحمل الدراسي الكلي للطلاب خلال الفصل	50		

### Module Evaluation تقييم المادة الدراسية

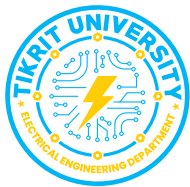
		Time (hr)	Weight (Marks)	Week Due	Relevant Learning Outcome
<b>Formative assessment</b>	Quizzes	2	20% (20)	3, 5, 7,, 9,11,13	LO #1, 2,3,....., 11
	Assignments (Homeworks)	6	15% (15)	2, 4, 6, 10,12,14	LO # 1, 2, 3, .....11
	Discussions	7	5% (5)	Continuous	
<b>Summative assessment</b>	Midterm Exam	2hrs	10% (10)	8	LO # 1-7
	Final Exam	3hrs	50% (50)	16	All
<b>Total assessment</b>			100% (100 Marks)		

## Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري

	Material Covered
Week 1	الجذور التاريخية لحقوق الانسان والديمقراطية في الحضارات القديمة
Week 2	حقوق الانسان والطفل والديمقراطية في الاسلام
Week 3	مصادر حقوق الانسان على المستوى الخارجي الدولي، سمات وخصائص الديمقراطية
Week 4	مصادر حقوق الانسان على المستوى الداخلي المحلي، مزايا الديمقراطية
Week 5	ضمانات حقوق الانسان على المستوى المحلي، مكونات الديمقراطية
Week 6	ضمانات حقوق الانسان على المستوى الدولي، الضمانات التي تكفل النظام الديمقراطي
Week 7	مجلس حقوق الانسان، الانتخابات واهميتها
Week 8	امتحان نصف الفصل
Week 9	التطور التكنولوجي واثره على حقوق الانسان والطفل والديمقراطية
Week 10	مفهوم العولمة، مؤسسات المجتمع المدني
Week 11	الحكم الرشيد (المبادئ، المعايير) ، الاستفتاء
Week 12	الدستور وانواعه
Week 13	حقوق الطفل في المواثيق والعهود الدولية
Week 14	الجرائم الانسانية (جرائم الابادة الجماعية) وتأثيرها على حقوق الانسان والطفل والانظمة الديمقراطية
Week 15	الديمقراطية المعاصرة وحقوق الانسان والطفل ودراسة حالات لأمثلة واقعية حدثت في المجتمعات الدولية والعربية وفي العراق
Week 16	امتحان نهاية الفصل

## Learning and Teaching Resources مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	كتاب حقوق الانسان والديمقراطية من تأليف :-1.د. ماهر صالح علوي الجبوري، ا.د رياض عزيز هادي ، ا.د. رعد ناجي الجدة، ا.م.د كامل عبد العنكود ، ا.م.د علي عبد الرزاق محمد، ا.د. حسان (محمد شفيق، (2009	Yes
Recommended Texts	الديمقراطية، من تأليف : تشارلز تيللي ، ترجمة محمد فاضل طباط ، الهيئة- 1 (المصرية العامة للكتاب،(2010 كتاب حقوق الانسان الاساسية والدور الامني لحمايتها، المؤلف: الدكتور -2 (مبارك علوي محمد،(2019	No
Websites		



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	Analogue Communication		Module Delivery
Module Type	Core		Theory Lecture Lab Tutorial Practical Seminar
Module Code	ELECT-316		
ECTS Credits	5		
SWL (hr/sem)	125		
Module Level	1	Semester (s) offered	1
Administering Department	Type Dept. Code	College	Type College Code
Module Leader	Ibrahim K. Sileh	e-mail	Ibrahimks65@ tu.edu.iq
Module Leader's Acad. Title	Assist. Prof.	Module Leader's Qualification	Ph.D.
Module Tutor	None	e-mail	None
Peer Reviewer Name		e-mail	
Review Committee Approval		Version Number	

## Relation With Other Modules العلاقة مع المواد الدراسية الأخرى

Prerequisite module	ELEC-227	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

<b>Module Aims</b> أهداف المادة الدراسية	<ol style="list-style-type: none"> <li>1. This course deals with the basic concept of analogue modulation</li> <li>2. To develop problem solving of AM-DSB-LC, AM-DSB-SC, AM-SSB and AM-VSB.</li> <li>3. To understand the modulation and demodulation of different types of AM.</li> <li>4. To perform the commercial AM Broadcast such as superhetrodyne receiver.</li> <li>5. To understand the angle modulation: frequency and phase.</li> <li>6. To understand the mathematical expressions of NB and WM for both frequency and phase modulation.</li> <li>7. To study the noise and its effect to performance of analogue modulation.</li> </ol>
<b>Module Learning Outcomes</b> مخرجات التعلم للمادة الدراسية	<ol style="list-style-type: none"> <li>1. Recognize how the analogue modulation can be improve the communication system.</li> <li>2. List the various terms associated analogue modulation.</li> <li>3. Discuss the modulation and demodulation circuits for different types of AM .</li> <li>4. Realization the commercial broadcast systems for AM and FM.</li> <li>5. Recognize how can the noise degradation the performance of AM and FM.</li> </ol>
<b>Indicative Contents</b> المحتويات الإرشادية	

## Learning and Teaching Strategies استراتيجيات التعلم والتعليم

<b>Strategies</b>	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 للطلاب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطلاب خلال الفصل	74	Structured SWL (h/w) الحمل الدراسي المنتظم للطلاب أسبوعياً	4.9
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطلاب خلال الفصل	51	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطلاب أسبوعياً	3.4
Total SWL (h/sem) الحمل الدراسي الكلي للطلاب خلال الفصل	125		

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

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	Available in the Library?
Required Texts	1) Ferrell G. Stremmer, "Introduction to Communication Systems", Eddition Wesly publishing company, 1990. 2) B. P. Lathi, "Modern Digital and Analog Communication System", Rinehert and Winston, Inc 1989. 3) R. E. Ziemer and W.H. Tranter, "Principles of Communications", JohnWiley and Sons, Inc., 1995. 4) Symon Haykin, "Communication Systems", John Wiley and Sons, Inc.,2001. 5) Hwie P. Hsu, "Analog and Digital Communications", (Schaum's outline Series", McGRAW-Hill International Edition, 1994.	Yes
Recommended Texts		
Websites		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	ENGINEERING AS SOCIAL EXPERIMENTATION: Engineering as Experimentation. Basic elements of communication system:
Week 2	Signal classification, periodic and non-periodic
Week 3	Linear Modulation- Amplitude Modulation (AM):
Week 4	AM/DSB- SC: Modulation, demodulation, Generation and receiver.
Week 5	AM/DSB- LC: Modulation, demodulation, Generation and receiver.
Week 6	AM/SSB, AM/VSB: Modulation, demodulation, Generation and receiver.
Week 7	Commercial AM Broadcast (TRF and super hetrodyne receiver)
Week 8	Midterm exam
Week 9	Angle modulation: (FM/PM)
Week 10	Narrow Band (FM/PM).
Week 11	Wide Band (FM/PM)..
Week 12	Commercial FM Broadcast.
Week 13	Noise: Types, time diagram, power calculation, thermal white Gaussian noise (AWGN).Noise in angle modulation system.
Week 14	Noise in AM modulation and angle modulation
Week 15	Preparatory Week
Week 16	Final Exam

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Lab 1: adder and multiplier
Week 2	Lab 2: voltage control oscillator
Week 3	Lab 3: filters, LOF, HPF, BPF and BSF
Week 4	Lab 4: AM-DSB-LC
Week 5	Lab 5: AM-DSB-SC
Week 6	Lab 6: AM-SSB
Week 7	Lab 7:Frequency modulation (FM)





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 Communication		Module Delivery
Module Type	Core		Theory Lecture Lab Tutorial Practical Seminar
Module Code	ELEC-326		
ECTS Credits	5		
SWL (hr/sem)	125		
Module Level	3	Semester (s) offered	2
Administering Department	Type Dept. Code	College	Type College Code
Module Leader	Ibrahim K. Sileh	e-mail	Ibrahimks65@ tu.edu.iq
Module Leader's Acad. Title	Assist. Prof.	Module Leader's Qualification	Ph.D.
Module Tutor	None	e-mail	None
Peer Reviewer Name		e-mail	
Review Committee Approval		Version Number	

## Relation With Other Modules العلاقة مع المواد الدراسية الأخرى

Prerequisite module	ELEC-316	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

<b>Module Aims</b> أهداف المادة الدراسية	<ol style="list-style-type: none"> <li>1. This course deals with the basic concept of digital modulation</li> <li>2. To develop problem solving of PAM, PWM and PPM.</li> <li>3. To understand the modulation and demodulation of different types of digital modulation.</li> <li>4. To perform the time division multiplexing</li> <li>5. To understand the ASK, FSK and PSK.</li> <li>6. To understand the principle of multi-level ASK and PSK.</li> <li>7. To study the noise and its effect to performance of digital modulation.</li> </ol>
<b>Module Learning Outcomes</b> مخرجات التعلم للمادة الدراسية	<ol style="list-style-type: none"> <li>1. Recognize how the digital modulation can be improving the communication system.</li> <li>2. List the various terms associated digital modulation.</li> <li>3. Discuss the modulation and demodulation circuits for different types of digital modulation.</li> <li>4. Realization the time division multiplexing.</li> <li>5. Recognize how can the noise degradation the performance of digital modulation.</li> </ol>
<b>Indicative Contents</b> المحتويات الإرشادية	

## Learning and Teaching Strategies استراتيجيات التعلم والتعليم

<b>Strategies</b>	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 للطلاب

Structured SWL (h/sem) الحمل الدراسي المنتظم للطلاب خلال الفصل	74	Structured SWL (h/w) الحمل الدراسي المنتظم للطلاب أسبوعياً	4.9
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطلاب خلال الفصل	51	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطلاب أسبوعياً	3.4
Total SWL (h/sem) الحمل الدراسي الكلي للطلاب خلال الفصل	125		

### Module Evaluation تقييم المادة الدراسية

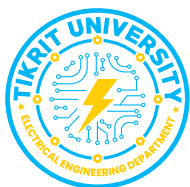
		Time (hr)	Weight (Marks)	Week Due	Relevant Learning Outcome
<b>Formative assessment</b>	Quizzes	2	10% (10)	5, 10	
	Assignments	2	10% (10)	2, 12	
	Projects / Lab.	1	10% (10)	Continuous	
	Report	1	10% (10)	13	
<b>Summative assessment</b>	Midterm Exam	2hrs	10% (10)	8	
	Final Exam	2hrs	50% (50)	16	All
<b>Total assessment</b>			100% (100 Marks)		

### Learning and Teaching Resources مصادر التعلم والتدريس

	Text	Available in the Library?
<b>Required Texts</b>	1) Ferrell G. Stremmler, "Introduction to Communication Systems", Edition Wesley publishing company, 1990. 2) B. P. Lathi, "Modern Digital and Analog Communication System", Rinehart and Winston, Inc 1989. 3) R. E. Ziemer and W.H. Tranter, "Principles of Communications", JohnWiley and Sons, Inc., 1995. 4) Symon Haykin, "Communication Systems", John Wiley and Sons, Inc., 2001. 5) Hwie P. Hsu, "Analog and Digital Communications", (Schaum's outline Series", McGRAW-Hill International Edition, 1994.	Yes
<b>Recommended Texts</b>		
<b>Websites</b>		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Introduction to digital modulation
Week 2	Nyquist sampling theorem,
Week 3	Pulse modulation, PAM. PWM and PPM,
Week 4	Time Division Multiplexing (TDM):
Week 5	Signaling format (unipolar, bipolar and split- phase Manchester)
Week 6	Pulse Code modulation (PCM).
Week 7	Differential PCM , Delta Modulation
Week 8	Midterm exam
Week 9	Sinusoidal digital modulation : Amplitude Shift Keying (ASK):
Week 10	.Frequency Shift Keying (FSK)
Week 11	Phase Shift Keying (PSK):
Week 12	Multilevel keying Technique: M-ary ASK (MASK).
Week 13	Multilevel PSK (MPSK):
Week 14	Noise in ASK, PSK FSK (error probability using coherent matched filter and non-coherent detection).
Week 15	Preparatory Week
Week 16	Final Exam

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Phase modulation (PM)
Week 2	Demodulation of AM-DSB-LC
Week 3	Demodulation of AM-DSB-SC
Week 4	Demodulation of AM-SSB
Week 5	Demodulation of FM with a C-discriminator
Week 6	Demodulation of FM with a phase locked loop
Week 7	Demodulation of PM with a phase locked loop



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	ADVANCE Computer Engineering		Module Delivery
Module Type	Core		Theory Lecture Lab Tutorial Practical Seminar
Module Code	ELEC-327		
ECTS Credits	5		
SWL (hr/sem)	125		
Module Level	3	Semester (s) offered	2
Administering Department	Electrical Engineering	College	Engineering
Module Leader	Dr. Jalal N. Abdulbaqi	e-mail	Jalal.abdulbaqi@ tu.edu.iq
Module Leader's Acad. Title	Lecturer	Module Leader's Qualification	Ph.D.
Module Tutor	Dr. Jalal N. Abdulbaqi	e-mail	Jalal.abdulbaqi@ 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	ELEC-317	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

<b>Module Aims</b> أهداف المادة الدراسية	<ul style="list-style-type: none"> <li>To enable students to design and analyze the data-path and pipeline of processors.</li> <li>To introduce students to the memory technologies used in computer systems, including cache, virtual memory, and performance optimization techniques.</li> <li>To provide students with an understanding of parallel processors and their architectures.</li> </ul>
<b>Module Learning Outcomes</b> مخرجات التعلم للمادة الدراسية	On successful completion of this module, students will be able to: <ol style="list-style-type: none"> <li>Design and analyze the data-path and pipeline of processors.</li> <li>Analyze the memory technologies used in computer systems, including cache, virtual memory, and performance optimization techniques.</li> <li>Explain the architecture of parallel processors and their programming techniques.</li> </ol>
<b>Indicative Contents</b> المحتويات الإرشادية	<ul style="list-style-type: none"> <li>Processors Data-Path and Pipeline: design and analysis of data-path and pipeline.</li> <li>Memory: technologies, cache, performance, virtual memory, and performance optimization techniques.</li> <li>Parallel Processors: architectures and programming techniques.</li> </ul>
<b>Course Description</b>	This module covers the fundamental concepts of computer engineering, including the data-path and pipeline, memory technologies, and parallel processors. The module introduce design of the data-path and pipeline of processors. Then introduces memory technologies, including cache, virtual memory, and performance optimization techniques, and covers parallel processors and their architectures.

## Learning and Teaching Strategies استراتيجيات التعلم والتعليم

<b>Strategies</b>	The module will be delivered through a combination of lectures, assignments, quizzes, and lab sessions. Lectures will provide an overview of the topics, while assignments and quizzes will enable students to apply their knowledge and check their understanding. Lab sessions will provide hands-on experience with computer engineering tools and techniques. The module will also include self-directed learning, where students are expected to read and research on their own to enhance their understanding of the subject matter.
-------------------	--



### Student Workload (SWL) الحمل الدراسي للطلاب

Structured SWL (h/sem) الحمل الدراسي المنتظم للطلاب خلال الفصل	74	Structured SWL (h/w) الحمل الدراسي المنتظم للطلاب أسبوعياً	4.9
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطلاب خلال الفصل Library, dorm, home memorizing 25 Preparation for tests 15 Homeworks 5	51	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطلاب أسبوعياً	3.4
Total SWL (h/sem) الحمل الدراسي الكلي للطلاب خلال الفصل	125		

### Module Evaluation تقييم المادة الدراسية

		Time (hr)	Weight (Marks)	Week Due	Relevant Learning Outcome
<b>Formative assessment</b>	Quizzes	2	15% (15)	2-7, 10-15	LO # 1, 2, 3
	Assignments	2	10% (10)	3, 5, 7, 11, 13, 15	LO # 1, 2, 3
	Lab.	14	15% (15)	Continuous	
<b>Summative assessment</b>	Midterm Exam	1.5hrs	10% (10)	8	LO # 1, 2, 3
	Final Exam	3hrs	50% (50)	16	All
<b>Total assessment</b>			100% (100 Marks)		

### Learning and Teaching Resources مصادر التعلم والتدريس

	Text	Available in the Library?
<b>Required Texts</b>	Computer Organization and Design, by Patterson and Hennessy, RISC-V Edition, 2nd Edition, 2021, ISBN: 978-0-12-820331-6	No
<b>Recommended Texts</b>	The RISC-V Reader: An Open Architecture Atlas, by Patterson and Waterman, 2017,	No
<b>Websites</b>	<a href="https://riscv.org/technical/specifications/">https://riscv.org/technical/specifications/</a>	

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Processor: Building a Datapath
Week 2	Processor: Pipelining
Week 3	Processor: Pipeline Datapath & Control
Week 4	Processor: Data Hazards: Forwarding vs Stalling
Week 5	Processor: Branch Hazards
Week 6	Processor: Exceptions and Interrupts
Week 7	Processor: Processor (Pipelining)
Week 8	Midterm exam
Week 9	Memory: Memory Technologies
Week 10	Memory: Cache Memory
Week 11	Memory: Cache Performance
Week 12	Memory: Virtual Machines
Week 13	Memory: Virtual Memory
Week 14	Parallel Processors: Multicore, Multithreading
Week 15	Parallel Processors: Graphics Processing Units
Week 16	Final Exam

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Lab 1: Introduction to Verilog HDL - Logic Gates
Week 2	Lab 2: Decoders and Encoders
Week 3	Lab 3: Multiplexer and Demultiplexer
Week 4	Lab 4: 4-bit binary to gray code converter
Week 5	Lab 5: Full Adder and ALU
Week 6	Lab 6: Flip-Flops
Week 7	Lab 7: Counters





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	ADVANCE OF Electrical Power		Module Delivery
Module Type	Core		Theory Lecture Lab Tutorial Practical Seminar
Module Code	ELEC-324		
ECTS Credits	5		
SWL (hr/sem)	125		
Module Level	3	Semester (s) offered	1,2
Min number of students	15	Max number of students	100
Administering Department	Electrical Engineering	College	Engineering
Module Leader	Aous Naji Rasheed	e-mail	eng.aous@tu.edu. iq
Module Leader's Acad. Title	Assistant Lecturer	Module Leader's Qualification	Msc.
Module Tutor	None	e-mail	None
Peer Reviewer Name	Arkan Ahmed Hussein	e-mail	aalganabe@ tu.edu.iq
Review Committee Approval	01/06/2023	Version Number	1.0

## Relation With Other Modules العلاقة مع المواد الدراسية الأخرى

Prerequisite module	ELEC-314	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

<b>Module Aims</b> أهداف المادة الدراسية	Continuing with the students to teach them the third basic of electrical power (distribution). Then giving the students in the last terminal of studying this subject, other topic concern with the protection by let them know the most common devices in the electrical field (transducers, relays and circuit breakers).
<b>Module Learning Outcomes</b> مخرجات التعلم للمادة الدراسية	<ol style="list-style-type: none"> <li>1) Completing the subject of transmission lines which is already given in the first semester</li> <li>2) Explain all the parameters and characteristics of suspended transmission lines as well as the underground cables</li> <li>3) Everything concern with the distribution (whether it A.C system or D. C system)</li> </ol>
<b>Indicative Contents</b> المحتويات الإرشادية	<p>Indicative content includes the following.</p> <ul style="list-style-type: none"> <li>• Electrical characteristics of an overhead transmission lines (4 hrs)</li> <li>• Corona (12 hrs)</li> <li>• Underground cables (16 hrs)</li> <li>• Distribution (16 hrs)</li> <li>• Protection (8 hrs)</li> </ul>
<b>Course Description</b>	The course covers the following topics; the completing of characteristics of an overhead transmission lines. And it also covers an important phenomenon that cause some lose in the electrical power (Corona Power lose phenomenon). Then going forward with the last topic of transmission subject, which is the underground cable. The last basic of electrical power (distribution), is also studied in this course in both types (A.C and D.C). Lastly, the second course of electrical power covers protection and some electrical devices (transducers, relays and circuit breakers)

## Learning and Teaching Strategies استراتيجيات التعلم والتعليم

<b>Strategies</b>	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 In class lectures In class tests Seminars Discussions	73	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعياً	4.86
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل Library, dorm, home memorizing Preparation for tests Homeworks	52	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعياً	3.46
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	125		

### Module Evaluation

#### تقييم المادة الدراسية

		Time (hr)	Weight (Marks)	Week Due	Relevant Learning Outcome
<b>Formative assessment</b>	Quizzes	2	10% (10)	5, 10, 12, 14	LO #1, 2, 3, and 4
	Assignments (Homeworks)	5	10% (10)	2, 4, 6, 8, 10	LO # 1, 2, 3, 4, 5 and 6
	Seminars	4	8% (8)	Continuous	
	Discussions	6	12% (12)	Continuous	
<b>Summative assessment</b>	Midterm Exam	2hrs	10% (10)	7	LO # 1-5
	Final Exam	3hrs	50% (50)	16	All
<b>Total assessment</b>			100% (100 Marks)		

## Delivery Plan (Weekly Syllabus)

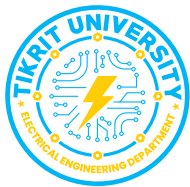
### المنهاج الاسبوعي النظري

	Material Covered
Week 1	Line voltage regulation and compensation, power circle diagrams
Week 2	Phenomenon, disruptive critical voltage, visual critical voltage, corona losses
Week 3	Phenomenon, disruptive critical voltage, visual critical voltage, corona losses
Week 4	Factor and conditions affecting corona losses
Week 5	Advantages and disadvantages of underground cables, types of cables, insulating resistance
Week 6	Capacitance, electrical stress, intersheath and capacitance grading in cables
Week 7	Midterm exam
Week 8	Completing capacitance, electrical stress, intersheath and capacitance grading in cables
Week 9	Completing capacitance, electrical stress, intersheath and capacitance grading in cables
Week 10	thermal characteristics, power factor in cables, capacitance in three-core cables
Week 11	Different types of distributors AC, DC
Week 12	Different types of distributors AC, DC
Week 13	Distributor fed from one, two ends
Week 14	Transducers and protective device, current and voltage transformer, relays, circuit breakers
Week 15	Transducers and protective device, current and voltage transformer, relays, circuit breakers
Week 16	Final Exam

## Learning and Teaching Resources

### مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	A course in electrical power. (By: Gobta)	Yes
Recommended Texts	(القدرة الكهربائية) المؤلف: عبد الصاحب حسن	Yes
Websites	N/A	



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	BASIC Computer Engineering		Module Delivery
Module Type	Core		Theory Lecture Lab Tutorial Practical Seminar
Module Code	ELEC-317		
ECTS Credits	5		
SWL (hr/sem)	125		
Module Level	3	Semester (s) offered	
Min number of students	15	Max number of students	100
Administering Department	Electrical Engineering	College	Engineering
Module Leader	Dr. Jalal N. Abdulbaqi	e-mail	Jalal.abdulbaqi@tu.edu.iq
Module Leader's Acad. Title	Assistant Lecturer	Module Leader's Qualification	Msc.
Module Tutor	Arkan Ahmed Hussein	e-mail	Jalal.abdulbaqi@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	ELEC-213	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

<b>Module Aims</b> أهداف المادة الدراسية	<ul style="list-style-type: none"> <li>To introduce students to the history and technology of computers and their performance and power requirements.</li> <li>To enable students to understand the instruction set architecture of the RISC-V processor and its programming techniques.</li> <li>To provide students with an understanding of computer arithmetic operations and the techniques used in their implementation.</li> </ul>
<b>Module Learning Outcomes</b> مخرجات التعلم للمادة الدراسية	On successful completion of this module, students will be able to: <ol style="list-style-type: none"> <li>Explain the history and technology of computers and their performance and power requirements.</li> <li>Analyze the instruction set architecture of the RISC-V processor and its programming techniques.</li> <li>Apply the knowledge of computer arithmetic operations to design and analyze arithmetic units.</li> </ol>
<b>Indicative Contents</b> المحتويات الإرشادية	<ul style="list-style-type: none"> <li>Introduction to Computer Engineering: history, technology, computer performance, and power requirements.</li> <li>Instruction Set Architecture: instruction sets for RISC-V processor and programming techniques.</li> <li>Computer Arithmetic Operations: implementation techniques and design of arithmetic units.</li> </ul>
<b>Course Description</b>	The course covers the following topics; the completing of characteristics of an overhead transmission lines. And it also covers an important phenomenon that cause some lose in the electrical power (Corona Power lose phenomenon). Then going forward with the last topic of transmission subject, which is the underground cable. The last basic of electrical power (distribution), is also studied in this course in both types (A.C and D.C). Lastly, the second course of electrical power covers protection and some electrical devices (transducers, relays and circuit breakers)

## Learning and Teaching Strategies استراتيجيات التعلم والتعليم

<b>Strategies</b>	The module will be delivered through a combination of lectures, assignments, quizzes, and lab sessions. Lectures will provide an overview of the topics, while assignments and quizzes will enable students to apply their knowledge and check their understanding. Lab sessions will provide hands-on experience with computer engineering tools and techniques. The module will also include self-directed learning, where students are expected to read and research on their own to enhance their understanding of the subject matter.
-------------------	--



### Student Workload (SWL) الحمل الدراسي للطالب

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	74	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعياً	4.9
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل Library, dorm, home memorizing 25 Preparation for tests 15 Homeworks 5	51	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعياً	3.4
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	125		

### Module Evaluation تقييم المادة الدراسية

		Time (hr)	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	15% (15)	2-8, 11-15	LO # 1, 2, 3
	Assignments	2	10% (10)	4, 7, 12, 14	LO # 1, 2, 3
	Lab	14	15% (15)	Continuous	
Summative assessment	Midterm Exam	1.5hrs	10% (10)	9	LO # 1-3
	Final Exam	3hrs	50% (50)	16	All
Total assessment			100% (100 Marks)		

### Learning and Teaching Resources مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Computer Organization and Design, by Patterson and Hennessy, RISC-V Edition, 2nd Edition, 2021, ISBN: 978-0-12-820331-6	No
Recommended Texts	The RISC-V Reader: An Open Architecture Atlas, by Patterson and Waterman, 2017	No
Websites	<a href="https://riscv.org/technical/specifications/">https://riscv.org/technical/specifications/</a>	

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Introduction: History, Technology
Week 2	Introduction: Computer Performance
Week 3	Introduction: Power, Multi-core CPU
Week 4	Instructions: Operations & Operands of the Computer Hardware
Week 5	Instructions: Representing Instructions in the Computer
Week 6	Instructions: Procedure Calling
Week 7	Instructions: Addressing Modes
Week 8	Instructions: Translating and Starting a Program
Week 9	Midterm
Week 10	Computer Arithmetic: Arithmetic for Integers
Week 11	Computer Arithmetic: Floating Point Representation
Week 12	Computer Arithmetic: Floating Point Operations
Week 13	Computer Arithmetic: Accurate Arithmetic
Week 14	Computer Arithmetic: Floating Point Instructions
Week 15	Computer Arithmetic: Subword Parallelism
Week 16	Final Exam

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Lab 1: Introduction to RISC-V ISA
Week 2	Lab 2: Integer Computation
Week 3	Lab 3: Load & Store
Week 4	Lab 4: Bitwise operations
Week 5	Lab 5: Conditional Branch
Week 6	Lab 6: Unconditional Jump
Week 7	Lab 7: Procedure Calling





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	ENTRANCE OF Electrical Power		Module Delivery
Module Type	Core		Theory Lecture Lab Tutorial Practical Seminar
Module Code	ELEC-314		
ECTS Credits	5		
SWL (hr/sem)	125		
Module Level	3	Semester (s) offered	1
Min number of students	15	Max number of students	100
Administering Department	Electrical Engineering	College	Engineering
Module Leader	Aous Naji Rasheed	e-mail	eng.aous@tu.edu. iq
Module Leader's Acad. Title	Assistant Lecturer	Module Leader's Qualification	Msc.
Module Tutor		e-mail	
Peer Reviewer Name	Arkan Ahmed Hussein	e-mail	aalganabe@ tu.edu.iq
Review Committee Approval	01/06/2023	Version Number	1.0

## Relation With Other Modules العلاقة مع المواد الدراسية الأخرى

Prerequisite module	ELEC-215	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	To help the students know everything about the three basics of electrical power (Generation, Transmission and distribution). The knowledge include both practical terms and mathematical model of each source of electrical generation such as thermal plants, hydroelectrically stations and nuclear reactors, as well as other auxiliary sources (sun, wind.. etc.). Same thing applied on the other second basic (the transmission lines)
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	<ol style="list-style-type: none"> <li>1) Producing an Engineer to the society that can face problems and solve them</li> <li>2) Understanding the importance of electrical energy and why we use other different sources of energy to convert them and generate the electricity</li> <li>3) The advantages and disadvantages of each electrical generation station</li> <li>4) Kelvin's law and the best method to choose the cross section area of any conductor</li> <li>5) All the parameters and characteristics of suspended transmission lines as well as the underground cables</li> </ol>
Indicative Contents المحتويات الإرشادية	<p>Indicative content includes the following.</p> <ul style="list-style-type: none"> <li>• Sources of Electrical Energy (14 hrs)</li> <li>• Economical aspects of power system planning (10 hrs)</li> <li>• Mechanical design of a transmission line (12 hrs)</li> <li>• Transmission line parameters (12 hrs)</li> <li>• Electrical characteristics of an overhead transmission lines (8 hrs)</li> </ul>
Course Description	The course covers the following topics; most important sources of electrical energy as well as other auxiliary sources. Also, include economical aspects of power system planning and power factor improving. Details about the mechanical design of transmission line and the mathematical models for both calculation of sag and insulators. It covers also the parameters of suspended transmission lines (resistance, inductance and capacitance). And lastly the beginning of characteristics of an overhead transmission lines.

## 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 In class lectures 50 In class tests 5 Seminars 4 Discussions 6	73	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعياً	4.86
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل Library, dorm, home memorizing 30 Preparation for tests 20 Homeworks 10	52	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعياً	3.46
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	125		

## Module Evaluation تقييم المادة الدراسية

		Time (hr)	Weight (Marks)	Week Due	Relevant Learning Outcome
<b>Formative assessment</b>	Quizzes	2	10% (10)	5, 10, 12, 14	LO #1, 2, 3, and 4
	Assignments (Homeworks)	5	10% (10)	2, 4, 6, 8, 10	LO # 1, 2, 3, 4, 5 and 6
	Seminars	4	8% (8)	Continuous	
	Discussions	6	12% (12)	Continuous	
<b>Summative assessment</b>	Midterm Exam	2hrs	10% (10)	7	LO # 1-5
	Final Exam	3hrs	50% (50)	16	All
<b>Total assessment</b>			100% (100 Marks)		

## Delivery Plan (Weekly Syllabus)

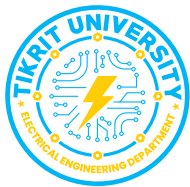
### المنهاج الاسبوعي النظري

	Material Covered
Week 1	ENGINEERING AS SOCIAL EXPERIMENTATION: Codes of Ethics. Structure of power system and its elements, power stations, hydro, thermal turbines
Week 2	Nuclear power, related topics on energy conversion
Week 3	AC or DC. Single and 3-phase transmission, development of electric power in Iraq
Week 4	Cost evaluation of power system projects, selection of generation units
Week 5	Power factor improvement, choice of economic transmission voltage, conductor size and Kelvin's law.
Week 6	Calculate of sag, number of towers and insulators
Week 7	Midterm exam
Week 8	Design of suspension insulators
Week 9	Voltage distribution and efficiency of string insulators
Week 10	Line resistance, line inductance, single-phase line with multi-conductors
Week 11	Line resistance, line inductance, single-phase line with multi-conductors
Week 12	Bundling, line inductance of three-phase transmission system
Week 13	Single phase and three-phase capacitance
Week 14	Short, medium and long transmission lines
Week 15	Short, medium and long transmission lines
Week 16	Final Exam

## Learning and Teaching Resources

### مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	A course in electrical power. (By: Gobta)	Yes
Recommended Texts	(القدرة الكهربائية (المؤلف: عبد الصاحب حسن	Yes
Websites	N/A	



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	Engineering statistics and probability		Module Delivery
Module Type	Basic		Theory Lecture Practical Seminar
Module Code	Math-302		
ECTS Credits	4		
SWL (hr/sem)	100		
Module Level	3	Semester (s) offered	1
Min number of students	15	Max number of students	100
Administering Department	Electrical Engineering	College	Engineering
Module Leader	Abdulmuttalib A. Hussein	e-mail	Abdulmuttalib.a.hussein@tu.edu.iq
Module Leader's Acad. Title	Assist. Lecturer	Module Leader's Qualification	PhD.
Module Tutor	None	e-mail	None
Peer Reviewer Name	Arkan Ahmed Hussein	e-mail	aalghanabe@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

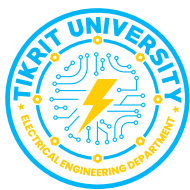
### أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية مع وصف مختصر

<b>Module Aims</b> أهداف المادة الدراسية	<ol style="list-style-type: none"> <li>1) To provide definition of statistic and give necessary idea.</li> <li>2) To explain the concept of data collection and representation.</li> <li>3) To give information about how to make data tabled.</li> <li>4) To explain the descriptive statistics.</li> <li>5) To calculate central and variation measurement.</li> <li>6) To give information about investigative statistics.</li> <li>7) To explain probability laws.</li> <li>8) To make analysis and decision.</li> </ol>
<b>Module Learning Outcomes</b> مخرجات التعلم للمادة الدراسية	<ol style="list-style-type: none"> <li>1) Use both conceptual and numerical techniques to solve engineering problems.</li> <li>2) Analyze and make decision.</li> <li>3) Understand and use the general idea of statistics of a particle.</li> <li>4) Understand and use the general ideas probability.</li> <li>5) Determine the distribution appropriate for any problem.</li> <li>6) Analyze the data collect from field.</li> <li>7) Find sample volume.</li> <li>8) Understand and use the general ideas of hypothesis tests.</li> <li>9) Apply data analysis by using SPSS program.</li> </ol>
<b>Indicative Contents</b> المحتويات الإرشادية	<p>Indicative content includes the following.</p> <ol style="list-style-type: none"> <li>1. Data collection and data representation. (6 hrs)</li> <li>2. Central and Variation measurements. (6 hrs)</li> <li>3. Principles of probability theory (9 hrs)</li> <li>4. Correlation and Regression (9 hrs)</li> <li>5. Hypotheses and Fitness tests (9 hrs)</li> <li>6. Test of variation, one-way test, two-way test. (9 hrs)</li> </ol>
<b>Course Description</b>	<p>The course covers the following topics; statistics of applications: Data collection, Data representation, Central measurements, comparisons between central measurements, Variation measurements, comparisons between Variation measurements Sampling and Estimation, Principles of probability theory, Probability Distributions, Correlation and Regression, Hypotheses and Fitness tests, Test of variation, one-way test, Test of variation, two-way test, method of virtual work.</p>

## Learning and Teaching Strategies

### استراتيجيات التعلم والتعليم

<b>Strategies</b>	<p>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.</p>
-------------------	---



## Student Workload (SWL)

### الحمل الدراسي للطالب

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل In class lectures 43 In class tests 5 Seminars 4 Discussions 3	45	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعياً	3
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل Library, dorm, home memorizing 25 Preparation for tests 20 Homeworks 10	55	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعياً	3.86
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
<b>Formative assessment</b>	Quizzes	2	10% (10)	2,3,4, 5, 6, 7	LO #1, 2, 3, and 4
	Assignments (Homeworks)	5	10% (10)	2, 4, 6, 8, 10	LO # 1,2,3,4,5 and 6
	Discussions	6	12% (12)	Continuous	
<b>Summative assessment</b>	Midterm Exam	2hrs	10% (10)	8	LO # 1-5
	Final Exam	3hrs	50% (50)	16	All
<b>Total assessment</b>			100% (100 Marks)		

## Delivery Plan (Weekly Syllabus)

### المنهاج الاسبوعي النظري

	Material Covered
Week 1	General principles, Principles of statistics
Week 2	Data collection, Data representation, Central measurements, Harmonic mean, median.
Week 3	Mode, comparisons between central measurements.
Week 4	Variation measurements, Range, Mean deviation, Deviation, Slandered deviation.
Week 5	Coefficient of variance, comparisons between variance measurements, sequeunce and measurements
Week 6	Principles of probability theory
Week 7	Sampling and Estimation
Week 8	Midterm exam
Week 9	Probability Distributions
Week 10	Probability Distributions
Week 11	Correlation and Regression
Week 12	Hypotheses and Fitness tests
Week 13	Hypotheses and Fitness tests
Week 14	Test of variation, one-way test.
Week 15	Test of variation, two-way test.
Week 16	Final Exam

## Learning and Teaching Resources

### مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	المدخل إلى الإحصاء"-د. خاشع محمود الراوي-جامعة الموصل/كلية الزراعة والغابات 1984-	Yes
Recommended Texts	مبادئ الإحصاء الهندسي"، د. باسم نزهت السامرائي، د. مثنى جبر، الجامعة التكنولوجية، دار الحكمة للطباعة والنشر، بغداد، 1990	No
	- الأساليب الإحصائية في العلوم الإدارية، تطبيقات باستخدام (spss)، د. صلاح الدين حسن الهيبي، جامعة مؤتة، دار الوائل للطباعة والنشر، عمان 2004.	Yes
Websites	N/A	





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	Numerical ANALYSIS		Module Delivery
Module Type	Basic		Theory Lecture Practical Seminar
Module Code	Math-301		
ECTS Credits	4		
SWL (hr/sem)	100		
Module Level	UGIII	Semester (s) offered	2
Administering Department	Electrical Engineering	College	Engineering
Module Leader	Abdulmuttalib. A. Hussein	e-mail	abdulmuttalib.a.hussein@tu.edu.iq
Module Leader's Acad. Title	Assist. Lecturer	Module Leader's Qualification	Master
Module Tutor	Abdulmuttalib. A. Hussein	e-mail	abdulmuttalib.a.hussein@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	Math-201	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

<b>Module Aims</b> أهداف المادة الدراسية	To enhance the problem-solving skills of engineering students using an extremely powerful problem-solving tool namely numerical method. The tool is capable of handling large system of equations, non-linearities and complicated geometries that are not uncommon in engineering practice and that are often impossible to solve analytically.
<b>Module Learning Outcomes</b> مخرجات التعلم للمادة الدراسية	On completion of this course students will be able to: 1- Understand numerical techniques to find the roots of non-linear equations and solution of system of linear equations. 2- Understand the difference operators and the use of interpolation. 3- Understand numerical differentiation and integration and numerical solutions of ordinary and partial differential equations.
<b>Indicative Contents</b> المحتويات الإرشادية	Indicative content includes the following. <ul style="list-style-type: none"> <li>• System of Linear Algebraic Equations (12hrs)</li> <li>• Open Methods to Estimate Root (6hrs)</li> <li>• Curve Fitting (9hrs)</li> <li>• Numerical Integration (3hrs)</li> <li>• Numerical Differentiation (3hrs)</li> <li>• Ordinary Differential Equations (6hrs)</li> <li>• Partial Differential Equations (6hrs)</li> </ul>
<b>Course Description</b>	The course is designed to provide the students with a comprehensive understanding of various numerical techniques used in solving mathematical problems that are challenging or impossible to solve analytically. This course focuses on the theoretical foundations, practical implementation, and applications of numerical methods in diverse fields of engineering. Throughout the course, students will develop a solid foundation in numerical analysis to solve complex mathematical problems.

## Learning and Teaching Strategies استراتيجيات التعلم والتعليم

<b>Strategies</b>	<ol style="list-style-type: none"> <li>1- Engage students in active learning activities such as problem-solving exercises, group discussions. Encourage students to actively participate in class, ask questions, and share their insights.</li> <li>2- Use real-world examples and applications to illustrate the relevance of numerical methods. Connect the concepts and techniques learned in class to their practical use in engineering.</li> <li>3- Break down complex numerical methods into step-by-step procedures, highlighting the underlying principles and assumptions at each stage. This approach helps students grasp the logic behind the methods and enhances their problem-solving skills.</li> <li>4- Encourage collaborative learning through group projects or problem-solving sessions. Students can work together to solve complex numerical problems, exchange ideas, and learn from each other's perspectives.</li> </ol>
-------------------	--



## Student Workload (SWL)

### الحمل الدراسي للطلاب

Structured SWL (h/sem) الحمل الدراسي المنتظم للطلاب خلال الفصل In class lectures           42 In class tests                   3	45	Structured SWL (h/w) الحمل الدراسي المنتظم للطلاب أسبوعياً	3
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطلاب خلال الفصل Library, dorm, home memorizing   17 Preparation for tests               15 Homeworks                           23	55	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطلاب أسبوعياً	3.5
Total SWL (h/sem) الحمل الدراسي الكلي للطلاب خلال الفصل	100		

## Module Evaluation

### تقييم المادة الدراسية

		Time (hr)	Weight (Marks)	Week Due	Relevant Learning Outcome
<b>Formative assessment</b>	Quizzes	2	10% (10)	All	LO #1, 2, and 3
	Assignments	6	30% (30)	All	LO #1, 2, and 3
<b>Summative assessment</b>	Midterm Exam	2hrs	10% (10)	7	LO # 1-2
	Final Exam	3hrs	50% (50)	16	All
<b>Total assessment</b>			100% (100 Marks)		

## Delivery Plan (Weekly Syllabus)

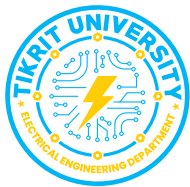
### المنهاج الاسبوعي النظري

	Material Covered
Week 1	Mathematical Background: - Matrix - Matrix operations - Determinant - Matrix inversion
Week 2	System of Linear Algebraic Equations: Gauss Elimination
Week 3	System of Linear Algebraic Equations: Matrix Inversion
Week 4	System of Linear Algebraic Equations: The Gauss-Seidle Method
Week 5	Open Methods to Estimate Root: The Newton Raphson Method
Week 6	Open Methods to Estimate Root: The Secant Method
Week 7	Curve Fitting: Linear Regression
Week 8	Curve Fitting: Newton's Divided-Difference Interpolation Polynomials
Week 9	Curve Fitting: Lagrange Interpolation Polynomials
Week 10	Numerical Integration - The Trapezoidal Rule - Simpson Rules
Week 11	Numerical Differentiation Richardson Extrapolation
Week 12	Ordinary Differential Equations - Euler's Method - Modified Euler's Method
Week 13	Ordinary Differential Equations - Runge -Kutta Methods
Week 14	Differential Equations - Finite Difference. Elliptic Equations
Week 15	Differential Equations - Finite Difference. Parabolic Equations
Week 16	Final Exam

## Learning and Teaching Resources

### مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Numerical Methods for Engineers. By Stephen Chapra	Yes
Recommended Texts	Numerical Methods by Rao V. Dukkipati	
Websites	N/A	



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	Single phase and synchronous machines		Module Delivery
Module Type	Core		Theory Lecture Practical Seminar
Module Code	ELEC-323		
ECTS Credits	6		
SWL (hr/sem)	150		
Module Level	3	Semester (s) offered	2
Administering Department	Electrical Engineering	College	Engineering
Module Leader	Layth F. Abbas	e-mail	Laithfadhil84@tu.edu.iq
Module Leader's Acad. Title	Assist. Lecturer	Module Leader's Qualification	Msc.
Module Tutor	Layth F. Abbas	e-mail	Laithfadhil84@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	ELEC-313	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	In this course, students learn Construction, types, equivalent circuit, torque / speed characteristics of single phase induction motor. Additionally, synchronous generator construction, salient and non-salient pole types , E.M.F. equation, armature reaction and parallel operation of synchronous generators. Consequentially, synchronous motor construction will be stated too.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	<ol style="list-style-type: none"> <li>Understand the Construction, equivalent circuit, torque / speed characteristics of single phase induction motor.</li> <li>Demonstrate knowledge of type of single phase motor, characteristics and typical application.</li> <li>Understand synchronous generator construction, salient and non-salient pole types , E.M.F. equation, armature reaction.</li> <li>Identify phasor diagram for salient and non -salient pole generators, voltage regulation.</li> <li>Explain parallel operation of synchronous generators.</li> <li>Understand synchronous motor construction, synchronous motor phasor diagram and equivalent circuit .</li> </ol>
Indicative Contents المحتويات الإرشادية	<p>Indicative content includes the following.</p> <ol style="list-style-type: none"> <li>Introduction to Single Phase Induction Motor, construction ,equivalent circuit, torque / speed characteristics (8 hrs)</li> <li>Type of single phase motor, characteristics and typical application. (8 hrs)</li> <li>Synchronous generator construction, salient and non-salient pole types , E.M.F. equation, armature reaction. (12 hrs)</li> <li>phasor diagram for salient and non -salient pole generators, voltage regulation (12 hrs)</li> <li>parallel operation of synchronous generators, (20 hrs)</li> <li>Synchronous motor construction, synchronous motor phasor diagram and equivalent circuit, synchronous motor starting (5 hrs)</li> </ol>
Course Description	This course aims to establish fundamental knowledge of introduction and Construction of single phase induction motor. Presentation single phase types and principles of operation. Then explain the synchronous generator construction and salient and non-salient pole types. Parallel operation of synchronous generators are discussed. Synchronous motor construction are also introduced.

## Learning and Teaching Strategies استراتيجيات التعلم والتعليم

Strategies	The learning and teaching strategy is planned to: Introduce the single Phase Induction Motor construction, equivalent circuit and types. Consequentially, synchronous generator construction and solving 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

<b>Structured SWL (h/sem)</b> الحمل الدراسي المنتظم للطالب خلال الفصل In class lectures 56 In class tutorials 9 In class tests 5 Seminars 4	88	<b>Structured SWL (h/w)</b> الحمل الدراسي المنتظم للطالب أسبوعياً	5.86
<b>Unstructured SWL (h/sem)</b> الحمل الدراسي غير المنتظم للطالب خلال الفصل Library, dorm, home memorizing 21 Preparation for tests 20 Homeworks 10	62	<b>Unstructured SWL (h/w)</b> الحمل الدراسي غير المنتظم للطالب أسبوعياً	4.13
<b>Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل</b>	150		

### Module Evaluation تقييم المادة الدراسية

		Time (hr)	Weight (Marks)	Week Due	Relevant Learning Outcome
<b>Formative assessment</b>	Quizzes	2	10% (10)	All	LO #1, 2, and 3
	Assignments	6	30% (30)	All	LO #1, 2, and 3
<b>Summative assessment</b>	Midterm Exam	2hrs	10% (10)	7	LO # 1-2
	Final Exam	3hrs	50% (50)	16	All
<b>Total assessment</b>			100% (100 Marks)		

### Learning and Teaching Resources مصادر التعلم والتدريس

	Text	Available in the Library?
<b>Required Texts</b>	Fitzgerald, Arthur Eugene, et al. Electric machinery. Vol. 5. New York: McGRAW-hill, 2003.	Yes
<b>Recommended Texts</b>	Mehta, V. K., and Rohit Mehta. Principles of electrical machines. S. Chand Publishing, 2008.ublisher: Pearson ISBN: 9780135486252	Yes
<b>Websites</b>	<a href="http://srikondasanthosh.blogspot.com/2016/02/principles-of-electrical-machines.html">http://srikondasanthosh.blogspot.com/2016/02/principles-of-electrical-machines.html</a>	

## Delivery Plan (Weekly Syllabus)

### المنهاج الاسبوعي النظري

	Material Covered
Week 1	Introduction to single Phase Induction Motors and Construction
Week 2	equivalent circuit, torque / speed characteristics
Week 3	Type of single phase motor
Week 4	characteristics and typical application
Week 5	Synchronous generator construction
Week 6	salient and non-salient pole types
Week 7	E.M.F. equation, armature reaction
Week 8	Midterm exam
Week 9	Phasor diagram for salient and non -salient pole generators
Week 10	Lagging, leading and unity phasor diagram
Week 11	Voltage regulation
Week 12	parallel operation of synchronous generators I
Week 13	parallel operation of synchronous generators II
Week 14	parallel operation of synchronous generators III
Week 15	Synchronous motor construction
Week 16	Final Exam

## Delivery Plan (Weekly Syllabus)

### المنهاج الاسبوعي النظري

	Material Covered
Week 1	Lab 1: Single Phase Induction Motor (split phase).
Week 2	Lab 2: Single Phase Induction Motor (capacitive phase).
Week 3	Lab 3: Review and tests of single Phase Induction Motors (split phase and capacitive phase).
Week 4	Lab 4: Three Phase synchronous generators (open circuit test).
Week 5	Lab 5: Three Phase synchronous generators (load test).
Week 6	Lab 6: Review and tests of three Phase synchronous generators (open circuit and load test).
Week 7	Lab 7: Final tests





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	Three phase induction motors		Module Delivery
Module Type	Core		Theory Lecture Practical Seminar
Module Code	ELEC-313		
ECTS Credits	6		
SWL (hr/sem)	150		
Module Level	3	Semester (s) offered	1
Administering Department	Electrical Engineering	College	Engineering
Module Leader	Layth F. Abbas	e-mail	Laithfadhil84@tu.edu.iq
Module Leader's Acad. Title	Assist. Lecturer	Module Leader's Qualification	Msc.
Module Tutor	Layth F. Abbas	e-mail	Laithfadhil84@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	ELEC-226	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

<b>Module Aims</b> أهداف المادة الدراسية	In this course, students learn Construction of three phase induction motor , cage and wound rotor types , principles of operation, Equivalent circuit, torque / speed characteristics , starting torque and maximum torque , speed control, rating and application , testing and efficiency .
<b>Module Learning Outcomes</b> مخرجات التعلم للمادة الدراسية	<ol style="list-style-type: none"> <li>1. Understand the Construction of three phase induction motor.</li> <li>2. Demonstrate knowledge of principle operation of three phase induction motor.</li> <li>3. Identify cage and wound rotor types.</li> <li>4. Find equivalent circuit of three Phase Induction Motors.</li> <li>5. Compute Power stages of three Phase Induction Motors</li> <li>6. Study torque / speed characteristics , starting torque and maximum torque , speed control, rating and application , testing and efficiency ..</li> </ol>
<b>Indicative Contents</b> المحتويات الإرشادية	<p>Indicative content includes the following.</p> <ol style="list-style-type: none"> <li>1. Introduction to three Phase Induction Motor, Construction , cage and wound rotor types , principles of operation (5 hrs)</li> <li>2. Equivalent circuit, torque/speed characteristics (16 hrs)</li> <li>3. Starting torque, running torque and maximum torque (22 hrs)</li> <li>4. speed control, rating and application, testing and efficiency. (22 hrs)</li> <li>5. Construction of Single Phase Induction Motor, equivalent circuit, different method of starting , torque / speed characteristics, type of single phase motor, characteristics and typical application.</li> </ol>
<b>Course Description</b>	This course aims to establish fundamental knowledge of introduction and Construction of three phase induction motor. Presentation of the cage and wound rotor types , principles of operation and then find the equivalent circuit of three phase induction motor. Torque/ speed characteristics are discussed. Starting torque, running torque and maximum torque, speed control, rating and application , testing and efficiency are also introduced.

## Learning and Teaching Strategies استراتيجيات التعلم والتعليم

<b>Strategies</b>	The learning and teaching strategy is planned to: Introduce the three Phase Induction Motor construction and solving 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

<b>Structured SWL (h/sem)</b> الحمل الدراسي المنتظم للطالب خلال الفصل In class lectures 56 In class tutorials 9 In class tests 5 Seminars 4	88	<b>Structured SWL (h/w)</b> الحمل الدراسي المنتظم للطالب أسبوعياً	<b>4.9</b>
<b>Unstructured SWL (h/sem)</b> الحمل الدراسي غير المنتظم للطالب خلال الفصل Library, dorm, home memorizing 21 Preparation for tests 20 Homeworks 10	62	<b>Unstructured SWL (h/w)</b> الحمل الدراسي غير المنتظم للطالب أسبوعياً	<b>3.4</b>
<b>Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل</b>	150		

### Module Evaluation تقييم المادة الدراسية

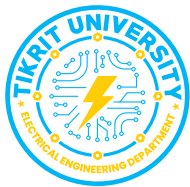
		Time (hr)	Weight (Marks)	Week Due	Relevant Learning Outcome
<b>Formative assessment</b>	Quizzes	2	15% (15)	5, 7, 10, 13	LO #1, 2, and 6
	Assignments	6	10% (10)	9, 13, 15	LO # 4, 5 and 6
	Lab	3	15% (15)	Continuous	
<b>Summative assessment</b>	Midterm Exam	2hrs	10% (10)	8	LO # 1-5
	Final Exam	3hrs	50% (50)	16	All
<b>Total assessment</b>			100% (100 Marks)		

### Learning and Teaching Resources مصادر التعلم والتدريس

	Text	Available in the Library?
<b>Required Texts</b>	Fitzgerald, Arthur Eugene, et al. Electric machinery. Vol. 5. New York: McGRAW-hill, 2003.	Yes
<b>Recommended Texts</b>	Mehta, V. K., and Rohit Mehta. Principles of electrical machines. S. Chand Publishing, 2008. publisher: Pearson ISBN: 9780135486252	Yes
<b>Websites</b>	<a href="http://srikondasanthosh.blogspot.com/2016/02/principles-of-electrical-machines.html">http://srikondasanthosh.blogspot.com/2016/02/principles-of-electrical-machines.html</a>	

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Engineering As Social Experimentation: Engineers as Responsible Experimenters
Week 2	Introduction to three Phase Induction Motors , Construction of three Phase Induction Motors
Week 3	Cage and wound rotor types
Week 4	Principles of operation of three Phase Induction Motors
Week 5	Equivalent circuit of three Phase Induction Motors
Week 6	Torque/speed characteristics
Week 7	Power stages of three Phase Induction Motors
Week 8	Midterm exam
Week 9	Rotor torque of three Phase Induction Motors
Week 10	Starting torque, running torque and maximum torque
Week 11	Speed control methods and by changing poles
Week 12	Speed control by changing frequency and slip
Week 13	Starting methods of three Phase Induction Motors
Week 14	Rating and application
Week 15	Testing and efficiency
Week 16	Final Exam

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Lab 1: Three Phase Induction Motors no load test
Week 2	Lab 2: Three Phase Induction Motors load test
Week 3	Lab 3: Review and tests of three Phase Induction Motors load test and no load test
Week 4	Lab 4: Speed control methods of three Phase Induction Motors and by changing poles
Week 5	Lab 5: Starting methods of three Phase Induction Motors (star-delta)
Week 6	Lab 6: Review and tests of Speed control methods and Starting methods of three Phase Induction Motors
Week 7	Lab 7:Final tests



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 Electronics		Module Delivery
Module Type	Core		Theory Lecture Tutorial Lab
Module Code	ELEC-321		
ECTS Credits	5		
SWL (hr/sem)	150		
Module Level	UGIII	Semester (s) offered	6
Administering Department	Electrical Engineering	College	Engineering
Module Leader	Riemann E. Ahmed	e-mail	Riemann.essa@tu.edu. iq
Module Leader's Acad. Title	Assistant Lecturer	Module Leader's Qualification	Msc.
Module Tutor	Riemann E. Ahmed	e-mail	Riemann.essa@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	ELEC-311	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

<b>Module Aims</b> أهداف المادة الدراسية	In this course, students learn Filter concepts, types, and design. Oscillator concepts and design. Power amplifiers types and design. IC biasing design. IC fabrication process.
<b>Module Learning Outcomes</b> مخرجات التعلم للمادة الدراسية	<ol style="list-style-type: none"> <li>1. Study the active filters.</li> <li>2. Demonstrate knowledge of oscillator</li> <li>3. Interpret and analyze power amplifiers.</li> <li>4. Learn designing integrated circuit design.</li> <li>5. Knowledge integrated circuit fabrication.</li> </ol>
<b>Indicative Contents</b> المحتويات الإرشادية	<p>Indicative content includes the following.</p> <ol style="list-style-type: none"> <li>1. Active filters (13 hrs).</li> <li>2. Oscillator (13 hrs).</li> <li>3. Power amplifiers (13 hrs).</li> <li>4. Integrated circuit design (13 hrs).</li> <li>5. Integrated circuit fabrication (13 hrs).</li> </ol>
<b>Course Description</b>	This course 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

<b>Strategies</b>	The learning and teaching strategy is aimed to: Study, analyze and design of the active filter, oscillator, power amplifier, current mirror, current repeater. Wilder current sources. Bipolar technology RTL, DTL, TTL, IC fabrication process, IC components (transistor, capacitor), phase looked loop PLL.
-------------------	--



### Student Workload (SWL) الحمل الدراسي للطالب

<b>Structured SWL (h/sem)</b> الحمل الدراسي المنتظم للطالب خلال الفصل In class lectures 56 In class tutorials 9 In class tests 5 Seminars 4	74	<b>Structured SWL (h/w)</b> الحمل الدراسي المنتظم للطالب أسبوعياً	4.9
<b>Unstructured SWL (h/sem)</b> الحمل الدراسي غير المنتظم للطالب خلال الفصل Library, dorm, home memorizing 21 Preparation for tests 20 Home works 10	51	<b>Unstructured SWL (h/w)</b> الحمل الدراسي غير المنتظم للطالب أسبوعياً	3.4
<b>Total SWL (h/sem)</b> الحمل الدراسي الكلي للطالب خلال الفصل	125		

### Module Evaluation تقييم المادة الدراسية

		Time (hr)	Weight (Marks)	Week Due	Relevant Learning Outcome
<b>Formative assessment</b>	Quizzes	2	15% (10)	3, 7, 11, 14	LO # 1,2, 3,4 and 5
	Assignments	6	10% (18)	3,7,9,10,13, 15	LO #1, 2,3,4, and 5
	Lab	3	15% (12)	Continuous	
<b>Summative assessment</b>	Midterm Exam	2hrs	10% (10)	8	LO # 1-5
	Final Exam	3hrs	50% (50)	16	All
<b>Total assessment</b>			100% (100 Marks)		

### Learning and Teaching Resources مصادر التعلم والتدريس

	Text	Available in the Library?
<b>Required Texts</b>	"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
<b>Recommended Texts</b>	"Integrated Electronics" by Jacob Millman, Christos Halkias, Chetan Parikh, 2nd ed, 2017, ISBN-10: 9780070151420, ISBN-13: 978-0070151420.	Yes
<b>Websites</b>	<a href="https://www.electronicsforu.com/technology-trends/learn-electronics/digital-electronics-basics">https://www.electronicsforu.com/technology-trends/learn-electronics/digital-electronics-basics</a>	

## Delivery Plan (Weekly Syllabus)

### المنهاج الاسبوعي النظري

	Material Covered
Week 1	Engineering as Social Experimentation: A Balanced Outlook on Law.
Week 2	Filter concepts, types, Filter approximations.
Week 3	Active RC filter design.
Week 4	Ladder design.
Week 5	Oscillator concepts, types.
Week 6	RC and LC oscillator.
Week 7	Crystal oscillator.
Week 8	Midterm exam
Week 9	Power amplifiers types. Class A.
Week 10	Power amplifier class B.
Week 11	Power amplifier class AB and push-pull amplifiers.
Week 12	IC biasing design, current mirror.
Week 13	Current repeater. Wilder current sources.
Week 14	Bipolar technology RTL, DTL, TTL.
Week 15	IC fabrication process, IC components (transistor, capacitor), phase locked loop PLL.
Week 16	Final Exam

## Delivery Plan (Weekly Syllabus)

### المنهاج الاسبوعي النظري

	Material Covered
Week 1	Lab 1: Unipolar Transistors (Junction Field Effect Transistors) part1.
Week 2	Lab 2: Unipolar Transistors (Junction Field Effect Transistors) part2.
Week 3	Lab 3: Basic Amplifier circuits with BJT part1.
Week 4	Lab 4: Basic Amplifier circuits with BJT part2.
Week 5	Lab 5: Basic Amplifier circuits with FET part1.
Week 6	Lab 6: Basic Amplifier circuits with FET part2.
Week 7	Lab 7: Final tests





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	Analogy Electronics		Module Delivery
Module Type	Core		Theory Lecture Tutorial Lab
Module Code	ELEC-311		
ECTS Credits	5		
SWL (hr/sem)	125		
Module Level	UGxII 3	Semester (s) offered	5
Administering Department	Electrical Engineering	College	Engineering
Module Leader	Riemann E. Ahmed	e-mail	Riemann.essa@tu.edu. iq
Module Leader's Acad. Title	Assistant Lecturer	Module Leader's Qualification	Msc.
Module Tutor	Riemann E. Ahmed	e-mail	Riemann.essa@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	ELEC-224	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

<b>Module Aims</b> 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
<b>Module Learning Outcomes</b> مخرجات التعلم للمادة الدراسية	<ol style="list-style-type: none"> <li>1. Study the frequency response characteristics.</li> <li>2. Demonstrate knowledge of amplifier frequency response.</li> <li>3. Interpret and analyze feedback amplifier.</li> <li>4. Learn designing operational amplifier.</li> <li>5. Knowledge operational amplifier applications.</li> </ol>
<b>Indicative Contents</b> المحتويات الإرشادية	Indicative content includes the following. <ol style="list-style-type: none"> <li>1. Frequency response characteristics (13 hrs)</li> <li>2. Amplifier frequency response (13 hrs)</li> <li>3. Feedback Amplifier (13 hrs)</li> <li>4. Operational amplifier design (13 hrs)</li> <li>5. Operational amplifier applications ((13 hrs).</li> </ol>
<b>Course Description</b>	This course 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 locked loop PLL.

## Learning and Teaching Strategies استراتيجيات التعلم والتعليم

<b>Strategies</b>	The learning and teaching strategy is aimed to: Study and analyze the frequency amplifier and various amplifier configurations, response of feedback amplifier, Operational amplifier design, DC level shifting stage, Inverting and non-inverting amplifiers. Applications of Operational amplifier.
-------------------	---



### Student Workload (SWL) الحمل الدراسي للطالب

<b>Structured SWL (h/sem)</b> الحمل الدراسي المنتظم للطالب خلال الفصل In class lectures 65 In class tutorials 9 In class tests 5 Seminars 4	74	<b>Structured SWL (h/w)</b> الحمل الدراسي المنتظم للطالب أسبوعياً	4.9
<b>Unstructured SWL (h/sem)</b> الحمل الدراسي غير المنتظم للطالب خلال الفصل Library, dorm, home memorizing 21 Preparation for tests 20 Home works 10	51	<b>Unstructured SWL (h/w)</b> الحمل الدراسي غير المنتظم للطالب أسبوعياً	3.4
<b>Total SWL (h/sem)</b> الحمل الدراسي الكلي للطالب خلال الفصل	125		

### Module Evaluation تقييم المادة الدراسية

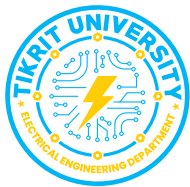
		Time (hr)	Weight (Marks)	Week Due	Relevant Learning Outcome
<b>Formative assessment</b>	Quizzes	2	15% (10)	5, 7, 11, 14	LO # 1,2, 3,4and 5
	Assignments	6	10% (18)	5,7,9,10,13, 15	LO #1, 2,3,4, and5
	Lab	3	15% (12)	Continuous	
<b>Summative assessment</b>	Midterm Exam	2hrs	10% (10)	8	LO # 1-5
	Final Exam	3hrs	50% (50)	16	All
<b>Total assessment</b>			100% (100 Marks)		

### Learning and Teaching Resources مصادر التعلم والتدريس

	Text	Available in the Library?
<b>Required Texts</b>	"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
<b>Recommended Texts</b>	"Integrated Electronics" by Jacob Millman ,Christos Halkias , Chetan Parikh, 2nd ed, 2017, ISBN-10: 9780070151420, ISBN-13: 978-0070151420.	Yes
<b>Websites</b>	<a href="https://www.elsys-design.com/en/analog-electronic-engineer/">https://www.elsys-design.com/en/analog-electronic-engineer/</a>	

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Frequency response of small signal models of JFET's.
Week 2	Frequency response of small signal models of BJT's.
Week 3	Frequency response of various amplifier configurations.
Week 4	Frequency response concepts, transistor at high frequency.
Week 5	Multistage and FET amplifier at low and high frequency.
Week 6	Feedback concepts, types, effects. Feedback topologies.
Week 7	Feedback analysis; series, shunt, stability and response of feedback amplifier.
Week 8	Midterm exam
Week 9	Operational amplifier design, characteristics and structure.
Week 10	Difference amplifier (dc and ac analysis).
Week 11	DC level shifting stage.
Week 12	Inverting and non-inverting amplifiers.
Week 13	Integrators, differentiator.
Week 14	Adder, subtractor.
Week 15	Comparator, precision diode rectifier.
Week 16	Final Exam

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Lab 1: Diode Rectifier Circuits.
Week 2	Lab 2: Zener diode.
Week 3	Lab 3: Characteristics of BJT part1.
Week 4	Lab 4: Characteristics of BJT part2.
Week 5	Lab 5: DC biasing of BJT part1.
Week 6	Lab 6: DC biasing of BJT part2.
Week 7	Lab 7: Final tests



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 Signal Processing (DSP)		Module Delivery
Module Type	Core		Theory Lecture Lab Tutorial Practical Seminar
Module Code	ELEC-411		
ECTS Credits	5		
SWL (hr/sem)	125		
Module Level	4	Semester (s) offered	2
Administering Department	Type Dept. Code	College	Type College Code
Module Leader	Ibrahim K. Sileh	e-mail	ibrahimks65@tu.edu.iq
Module Leader's Acad. Title	None	Module Leader's Qualification	None
Module Tutor		e-mail	
Peer Reviewer Name		e-mail	
Review Committee Approval		Version Number	

## Relation With Other Modules العلاقة مع المواد الدراسية الأخرى

Prerequisite module	ELEC-326	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

<b>Module Aims</b> أهداف المادة الدراسية	<ol style="list-style-type: none"> <li>1. This course deals with the basic concept of DSP</li> <li>2. To develop problem solving of digital filter and LTI systems.</li> <li>3. To understand the difference equations</li> <li>4. To perform DFT and FFT techniques</li> <li>5. To understand the properties of Z-Transform</li> <li>6. To design the digital filter by exploits the benefits of analogue filters.</li> <li>7. To realization the digital filter by several strategies.</li> <li>8. To modified the performance of digital filter by using window methods.</li> <li>9. To understand the FIR and IIR filers.</li> </ol>
<b>Module Learning Outcomes</b> مخرجات التعلم للمادة الدراسية	<ol style="list-style-type: none"> <li>1. Recognize how the digital filter in term of digital signals.</li> <li>2. List the various terms associated digital signals.</li> <li>3. Discuss the DFT with different types of realization.</li> <li>4. Describe the FFT in both methods, DIT and DIF.</li> <li>5. Recognize how can implements the Z-transform in difference equations</li> <li>6. Realization the digital filter by using analogue filters.</li> <li>7. Realization the IIR and FIR filter with different types.</li> </ol>
<b>Indicative Contents</b> المحتويات الإرشادية	
<b>Course Description</b>	

## Learning and Teaching Strategies استراتيجيات التعلم والتعليم

<b>Strategies</b>	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 للطلاب

Structured SWL (h/sem) الحمل الدراسي المنتظم للطلاب خلال الفصل	74	Structured SWL (h/w) الحمل الدراسي المنتظم للطلاب أسبوعياً	4.9
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطلاب خلال الفصل	51	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطلاب أسبوعياً	3.4
Total SWL (h/sem) الحمل الدراسي الكلي للطلاب خلال الفصل	125		

### Module Evaluation تقييم المادة الدراسية

		Time (hr)	Weight (Marks)	Week Due	Relevant Learning Outcome
<b>Formative assessment</b>	Quizzes	2	10% (10)	5, 10	
	Assignments	2	10% (10)	2, 12	
	Projects / Lab.	1	10% (10)	Continuous	
	Report	1	10% (10)	13	
<b>Summative assessment</b>	Midterm Exam	2hrs	10% (10)	8	
	Final Exam	2hrs	50% (50)	16	All
<b>Total assessment</b>			100% (100 Marks)		

## Delivery Plan (Weekly Syllabus)

### المنهاج الاسبوعي النظري

	Material Covered
Week 1	Basic concepts of digital signal processing (DSP), Sampling of continuous signal: signal reconstruction. Quantization: quantization error and SNR.
Week 2	Digital signals and systems: digital signals, linear time invariant, causal systems
Week 3	Difference equations and impulse response, digital convolution techniques.
Week 4	Discrete Fourier Transform (DFT): Matrix formulation of DFT.
Week 5	Fast Fourier Transform (FFT): Decimation in time (DIT).
Week 6	Decimation in frequency (DIF).
Week 7	Midterm exam
Week 8	The Z-Transform: properties, inverse Z-Transform.
Week 9	Digital filter design: classification and realization of discrete system, impulse response, step response and system response.
Week 10	Realization of Review of analogue filter design ( Butterworth and Chebyshev filters), LPF, HPF, BPF and BSF.
Week 11	Realization of digital filters: direct-form I, direct-form II, cascade and parallel.
Week 12	Window method of Finite impulse response (FIR): rectangular, triangular, Hamming, Hanning and blackman.
Week 13	Realization of Finite impulse response (FIR) filters
Week 14	Realization of Infinite impulse response (IIR) filters
Week 15	Preparatory Week
Week 16	Final Exam

## Delivery Plan (Weekly Syllabus)

### المنهاج الاسبوعي النظري

	Material Covered
Week 1	Amplitude shift key (ASK)
Week 2	Frequency shift key (FSK)
Week 3	Phase shift key (PSK)
Week 4	Puls code modulation (PCM)
Week 5	Delta modulation
Week 6	Time division Multiplexing (TDM)
Week 7	





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	Information theory		Module Delivery
Module Type	Core		Theory Lecture Lab Tutorial Practical Seminar
Module Code	ELEC-421		
ECTS Credits	5		
SWL (hr/sem)	125		
Module Level	4	Semester (s) offered	
Administering Department	Type Dept. Code	College	Type College Code
Module Leader	Ibrahim K. Sileh	e-mail	ibrahimks65@tu.edu. iq
Module Leader's Acad. Title	Assist. Prof.	Module Leader's Qualification	Ph.D.
Module Tutor	None	e-mail	None
Peer Reviewer Name		e-mail	
Review Committee Approval		Version Number	

## Relation With Other Modules العلاقة مع المواد الدراسية الأخرى

Prerequisite module	ELEC-411	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

<b>Module Aims</b> أهداف المادة الدراسية	<ol style="list-style-type: none"> <li>1. This course deals with the basic concept of Information theory.</li> <li>2. To develop problem solving of entropy and mutual information.</li> <li>3. To understand the capacity and efficiency for different systems.</li> <li>4. To perform Shannon-Fano and Hoffman codes.</li> <li>5. To perform several types of channel coding..</li> </ol>
<b>Module Learning Outcomes</b> مخرجات التعلم للمادة الدراسية	<ol style="list-style-type: none"> <li>1. Recognize how can find the amount of entropy and mutual information.</li> <li>2. List the various types of channel.</li> <li>3. Discuss the efficiency and redundancy of course coding.</li> <li>4. Describe the error correction codes.</li> <li>5. Recognize how can implements the encoder and decoder of different types of channel coding</li> </ol>
<b>Indicative Contents</b> المحتويات الإرشادية	
<b>Course Description</b>	

## Learning and Teaching Strategies استراتيجيات التعلم والتعليم

<b>Strategies</b>	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 للطلاب

Structured SWL (h/sem) الحمل الدراسي المنتظم للطلاب خلال الفصل	74	Structured SWL (h/w) الحمل الدراسي المنتظم للطلاب أسبوعياً	4.9
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطلاب خلال الفصل	51	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطلاب أسبوعياً	3.4
Total SWL (h/sem) الحمل الدراسي الكلي للطلاب خلال الفصل	125		

### Module Evaluation تقييم المادة الدراسية

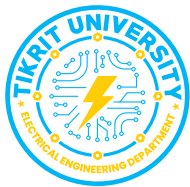
		Time (hr)	Weight (Marks)	Week Due	Relevant Learning Outcome
<b>Formative assessment</b>	Quizzes	2	10% (10)	5, 10	
	Assignments	2	10% (10)	2,12	
	Projects / Lab.	1	10% (10)	Continuous	
	Report	1	10% (10)	13	
<b>Summative assessment</b>	Midterm Exam	2hrs	10% (10)	8	
	Final Exam	2hrs	50% (50)	16	All
<b>Total assessment</b>			100% (100 Marks)		

### Learning and Teaching Resources مصادر التعلم والتدريس

	Text	Available in the Library?
<b>Required Texts</b>	1) Ferrell G. Stremmler, "Introduction to Communication Systems", Edition Wesley publishing company, 1990. 2) B. P. Lathi, "Modern Digital and Analog Communication System", Rinehart and Winston, Inc 1989. 3) R. E. Ziemer and W.H. Tranter, "Principles of Communications", John Wiley and Sons, Inc., 1995. 4) Symon Haykin, "Communication Systems", John Wiley and Sons, Inc., 2001. 5) Hwie P. Hsu, "Analog and Digital Communications", (Schaum's outline Series", McGRAW-Hill International Edition, 1994.	Yes
<b>Recommended Texts</b>		Yes
<b>Websites</b>		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	SAFETY, RESPONSIBILITIES AND RIGHTS: Conflicts of Interest , Occupational Crime , Professional Rights. Self-information, source entropy, source entropy rate and mutual information.
Week 2	Channel model BSC and TSC, joint and conditional entropies
Week 3	Capacity and efficiency for symmetric and non-symmetrical discrete channel.
Week 4	Optimum threshold setting.
Week 5	Capacity of continuous channel (Shannon eq.)
Week 6	Source coding: efficiency and redundancy of a code, fixed length codes.
Week 7	Variable length codes, Shannon-Fano code.
Week 8	Midterm exam
Week 9	Huffman code.
Week 10	Non-binary source coding, source extension of higher coding efficiency.
Week 11	Channel coding, even and odd parity error of detecting codes, probability of undetected errors.
Week 12	Error correcting codes: linear block code, Hamming distance, Hamming weight.
Week 13	Cyclic codes:
Week 14	Preparatory Week
Week 15	Comparator, precision diode rectifier.
Week 16	Final Exam

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Lab 1: adder and multiplier
Week 2	Lab 2: voltage control oscillator
Week 3	Lab 3: filters, LOF, HPF, BPF and BSF
Week 4	Lab 4: AM-DSB-LC
Week 5	Lab 5: AM-DSB-SC
Week 6	Lab 6: AM-SSB
Week 7	Lab 7: Frequency modulation (FM)



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 System Design		Module Delivery
Module Type	Core		Theory Lecture Lab Tutorial Practical Seminar
Module Code	ELEC-413		
ECTS Credits	7		
SWL (hr/sem)	175		
Module Level	4	Semester (s) offered	
Administering Department	Electrical Engineering	College	Engineering
Module Leader	Saad Mshhain Hardan	e-mail	Saad.m.hardan@tu.edu.iq
Module Leader's Acad. Title	Assistant Professor	Module Leader's Qualification	Ph.D.
Module Tutor	Saad Mshhain Hardan	e-mail	Saad.m.hardan@tu.edu.iq
Peer Reviewer Name		e-mail	
Review Committee Approval		Version Number	

## Relation With Other Modules العلاقة مع المواد الدراسية الأخرى

Prerequisite module	ELEC-326	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	<ol style="list-style-type: none"> <li>1. To understand Timing Circuit, its types and applications.</li> <li>2. To learn how to design the various types of Timing Circuits.</li> <li>3. To understand Finite state machine (FSM).</li> <li>4. Algorithm State machine (ASM)</li> <li>5. To understand Synchronous sequential design using FSM</li> <li>6. To Analysis Synchronous Systems using finite state machines.</li> <li>7. To learn Hardware Design of Micro Computers Microprocessors.</li> </ol>
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	<ol style="list-style-type: none"> <li>1. Describe the operation of astable, monostable and bistable multivibrator.</li> <li>2. Explain how to use transistors, op-amp and 555 timers to design each type of timing circuit.</li> <li>3. Explain how Schmitt trigger is work and analyses its transfer characteristics.</li> <li>4. Describe the general form of Synchronous sequential design.</li> <li>5. describe the finite state machine.</li> <li>6. identify Moore and mealy models of FSM.</li> <li>7. Understand Algorithm State machine (ASM)</li> <li>8. Explain how to analyze the finite-state machine.</li> <li>9. Explain how to build Synchronous sequential logic circuit using both models of FSM.</li> <li>10. Explain how to select Flip-flop to build Synchronous sequential logic circuit</li> <li>11. Define state assignment.</li> <li>12. Explain the Hardware description of Micro Computers Microprocessors.</li> <li>13. Be able to design Micro Computers using FSN.</li> </ol>
Indicative Contents المحتويات الإرشادية	<p>Indicative content includes the following.</p> <p><b>Timing Circuit:</b> Multivibrators, a stable, monostable and bistable multivibrator, applications of multivibrators. Design of astable, monostable and bistable multivibrator using three approaches (transistors, op-amp and 555 timers), Schmitt trigger [10 hrs].</p> <p><b>Synchronous Sequential Logic System Design:</b> Sequential Logic System, Finite state machine, Moore FSM model, Mealy FSM model. Finite-state Machine (FSM) Design Concepts, Finite-state Machine Synthesis, State Diagram, State Table and State Assigned Table, State Assignment, One-hot Encoding Method, Finite-state Machine Analysis, Algorithm State machine (ASM) Sequential Serial Adder, Sequential Circuit Counters, Sequential Logic System Implementation, State optimization. [25 hrs].</p> <p><b>Hardware Design of Micro Computers Microprocessors:</b> Central processing unit (CPU) design, FSM cycle, instruction set, two operand instructions, four operand instructions, instructions using a memory address, jump instructions, Datapath, input multiplexer, Accumulator, Register File, Control Word, Fetch, Decode, Execute [10 hrs].</p>

## 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 للطلاب

Structured SWL (h/sem) الحمل الدراسي المنتظم للطلاب خلال الفصل	87	Structured SWL (h/w) الحمل الدراسي المنتظم للطلاب أسبوعياً	5.8
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطلاب خلال الفصل	88	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطلاب أسبوعياً	5.86
Total SWL (h/sem) الحمل الدراسي الكلي للطلاب خلال الفصل	175		

### Module Evaluation تقييم المادة الدراسية

		Time (hr)	Weight (Marks)	Week Due	Relevant Learning Outcome
<b>Formative assessment</b>	Quizzes	2	15% (10)	5, 10, 13	LO #1, 2, 6, 8, 9 and 10
	Assignments	4	10% (10)	3,6, 11,14	LO # 3, 4, 6, 8,9,10 and 11
	Projects / Lab.	1	10% (10)	Continuous	
	Report	1	10% (10)	13	LO # 5, 8 and 10
<b>Summative assessment</b>	Midterm Exam	2hrs	10% (10)	7	LO # 1-7
	Final Exam	2hrs	50% (50)	16	All
<b>Total assessment</b>			100% (100 Marks)		

## Delivery Plan (Weekly Syllabus)

### المنهاج الاسبوعي النظري

	Material Covered
Week 1	Multivibrators, Design of astable multivibrator using transistors.
Week 2	Design of astable, monostable and bistable op-amp .
Week 3	Design of astable, monostable and bistable 555 timers), Schmitt trigger
Week 4	Sequential Logic System, Finite state machine, Moore FSM model, Mealy FSM model.
Week 5	Finite-state Machine (FSM) Design Concepts, Finite-state Machine Synthesis,
Week 6	State Diagram, State Table and State Assigned Table, State Assignment
Week 7	Mid-term Exam
Week 8	One-hot Encoding Method, Finite-state Machine Analysis, Algorithm State machine (ASM)
Week 9	Sequential Serial Adder, Sequential Circuit Counters
Week 10	Sequential Logic System Implementation, State optimization
Week 11	State optimization
Week 12	Central processing unit (CPU) design, FSM cycle, instruction set
Week 13	Two operand instructions, four operand instructions, instructions using a memory address
Week 14	jump instructions, Datapath, input multiplexer, Accumulator
Week 15	Register File, Control Word, Fetch, Decode, Execute
Week 16	Preparatory week before the final Exam

## Learning and Teaching Resources

### مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Digital Fundamental, Thomas I. Floyd, Pearson Prentice Hall	Yes
Recommended Texts	Fundamentals of Logic Design, Charles H. Roth, Jr. and Larry L. Kinney	No
Websites	<a href="https://www.coursera.org/browse/physical-science-and-engineering/electrical-engineering">https://www.coursera.org/browse/physical-science-and-engineering/electrical-engineering</a>	





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	Power Electronics		Module Delivery
Module Type	Core		Theory Lecture Lab Tutorial Practical Seminar
Module Code	ELEC-422		
ECTS Credits	8		
SWL (hr/sem)	200		
Module Level	UGxII 4	Semester (s) offered	
Administering Department	Electrical Engineering	College	Engineering
Module Leader	Arkan Ahmed Hussein	e-mail	aalganabe@tu.edu.iq
Module Leader's Acad. Title	Assistant Professor	Module Leader's Qualification	Ph.D.
Module Tutor	Arkan Ahmed Hussein	e-mail	aalganabe@tu.edu.iq
Peer Reviewer Name		e-mail	
Scientific Committee Approval Date	01/06/2023	Version Number	1.0

## Relation With Other Modules العلاقة مع المواد الدراسية الأخرى

Prerequisite module	ELEC-323	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

<b>Module Aims</b> أهداف المادة الدراسية	<ol style="list-style-type: none"> <li>To introduce students to the basic theory of power semiconductor devices and passive components, their practical applications in power electronics.</li> <li>To familiarize students to the principle of operation, design and synthesis of AC to Dc conversion circuits and their applications.</li> <li>To familiarize students to the principle of operation, design and synthesis of DC to Dc conversion circuits and their applications.</li> <li>Recognize the basic operation, losses and efficiency of the power electronics converters.</li> <li>Develop a good insight about the practical issues in power electronics circuit design.</li> <li>Explain the application requirements of converters in given applications.</li> </ol>
<b>Module Learning Outcomes</b> مخرجات التعلم للمادة الدراسية	<ol style="list-style-type: none"> <li>Understand the operation of power electronic devices and its applications.</li> <li>Analyze the I-V characteristics of SCR, DIAC and TRIAC.</li> <li>Analyze the characteristics of MOSFET, IGBT and UJT.</li> <li>Demonstrate the operation of Single phase fully controlled bridge converter with R and RL loads.</li> <li>Understand the characteristics of Step up and Step down chopper</li> <li>Distinguish the speed control of DC motor using converters.</li> </ol>
<b>Indicative Contents</b> المحتويات الإرشادية	<p>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</p>

## Learning and Teaching Strategies استراتيجيات التعلم والتعليم

<b>Strategies</b>	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	116	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعياً	7.73
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	84	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعياً	5.6
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	3	15% (10)	5, 10, 13	LO #1, 2, 5, 6, 7, and 9
	Assignments	4	8% (10)	3,6, 11,14	LO # 3, 4, 6, 8 and 9
	Projects / Lab.	1	12% (10)	Continuous	
	Report	1	5% (10)	13	LO # 5,6, 7 and 8
Summative assessment	Midterm Exam	2hrs	10% (10)	7	LO # 1-6
	Final Exam	3hrs	50% (50)	16	All
Total assessment			100% (100 Marks)		

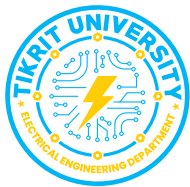
Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	Available in the Library?
Required Texts	Power Electronics Devices and Circuits, V. Jagannathan, 2011	Yes
Recommended Texts	1. M D Singh, K B Kanchandhani, "Power Electronics", Tata Mc Graw Hill Publishing Company, 2nd Edition, 1998. 2. Dr. 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		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	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 (i) resistive load (ii) inductive load with and without freewheeling diode.
Week 4	single phase (i) fully controlled (ii) half controlled bridge rec-tifiers with resistive and inductive loads.
Week 5	three-phase fully/half controlled bridge rectifier with resistive and inductive loads.
Week 6	DC to DC step down chopper   DC to Dc step up chopper
Week 7	Exam

## Delivery Plan (Weekly Syllabus)

### المنهاج الاسبوعي النظري

	<b>Material Covered</b>
<b>Week 1</b>	<ul style="list-style-type: none"> <li>• Applications of Power Electronic</li> <li>• Power Semiconductor Devices</li> <li>• Control Characteristics of Power Devices</li> <li>• Types of Power Electronic Circuits</li> <li>• Design of Power Electronics Equipment</li> </ul>
<b>Week 2</b>	<ul style="list-style-type: none"> <li>• Diodes with RC and RL Load</li> <li>• Diodes with LC and RLC Loads</li> <li>• Free-wheeling Diodes</li> <li>• Recovery of Trapped Energy with a Diode</li> </ul>
<b>Week 3</b>	<ul style="list-style-type: none"> <li>• Single-Phase Half-Wave Rectifiers</li> <li>• Performance Parameters</li> <li>• Single-Phase Full-Wave Rectifiers</li> </ul>
<b>Week 4</b>	<ul style="list-style-type: none"> <li>• Multi phase Star Rectifiers</li> <li>• Three-Phase Bridge Rectifiers</li> <li>• Rectifier Circuit Design</li> <li>• Effects of Source and Load Inductances</li> </ul>
<b>Week 5</b>	<ul style="list-style-type: none"> <li>• Principle of Phase- Controlled Converter Operation</li> <li>• Single-Phase Semi converters</li> <li>• Single-Phase Full Converters</li> <li>• Single-Phase Dual Converter</li> <li>• Single-Phase Series Converter</li> </ul>
<b>Week 6</b>	<ul style="list-style-type: none"> <li>• Three-Phase Half-Wave Converters</li> <li>• Three-Phase Semi converters</li> <li>• Three-Phase Full Converters</li> </ul>
<b>Week 7</b>	<ul style="list-style-type: none"> <li>• Three Phase Dual Converters</li> <li>• Power Factor Improvements</li> <li>• Design of Converter Circuits,</li> <li>• Effects of Load and Source Inductance</li> </ul>
<b>Week 8</b>	(Thyristor commutation techniques) <ul style="list-style-type: none"> <li>• Natural Commutation</li> <li>• Forced Commutation</li> <li>• Self Commutation</li> <li>• Impulse Commutation</li> <li>• Resonant Pulse Commutation</li> </ul>
<b>Week 9</b>	<ul style="list-style-type: none"> <li>• Complementary Commutation</li> <li>• External Pulse Commutation</li> <li>• Load-Side Commutation</li> <li>• Line-Side Commutation</li> <li>• Commutation Circuit Design</li> <li>• Commutation Capacitors</li> </ul>
<b>Week 10</b>	<ul style="list-style-type: none"> <li>• Principle of Step-Down Operation</li> <li>• Step-Down Choppers with RL Load</li> <li>• Principle of Step-Up Operation</li> <li>• Performance Parameters</li> <li>• Switching-Mode Regulators</li> </ul>
<b>Week 11</b>	<ul style="list-style-type: none"> <li>• Buck Regulators</li> <li>• Boost Regulators</li> <li>• Buck-Boost Regulators</li> <li>• Cuk Regulators</li> </ul>
<b>Week 12</b>	<ul style="list-style-type: none"> <li>• Limitations of Single-Stage Conversion</li> <li>• Thyristor Chopper Circuits</li> </ul>
<b>Week 13</b>	<ul style="list-style-type: none"> <li>• Impulse-Commutated Choppers</li> <li>• Effects of Source and Load Inductance</li> </ul>
<b>Week 14</b>	<ul style="list-style-type: none"> <li>• Impulse-Commutated Three-Thyristor</li> <li>• Resonant Pulse Choppers</li> </ul>
<b>Week 15</b>	<ul style="list-style-type: none"> <li>• Chopper Circuit Design</li> </ul>
<b>Week 16</b>	Preparatory week before the final Exam



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	Antenna AND PROPAGATION		Module Delivery
Module Type	Core		Theory Lecture Lab Tutorial Practical Seminar
Module Code	ELEC-428		
ECTS Credits	4		
SWL (hr/sem)			
Module Level	4	Semester (s) offered	2
Administering Department	Electrical Engineering	College	Engineering
Module Leader	Dr. MOHAMMED KAMIL	e-mail	mohamedkamil@tu.edu.iq
Module Leader's Acad. Title	Assistant Professor	Module Leader's Qualification	Ph.D.
Module Tutor	Dr. MOHAMMED KAMIL	e-mail	mohamedkamil@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	ELEC-326	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

<b>Module Aims</b> أهداف المادة الدراسية	The aim of the course is to give the students the antenna theory as well as the analytical and numerical methods for analysis of some practical antennas.
<b>Module Learning Outcomes</b> مخرجات التعلم للمادة الدراسية	On successful completion of this course students will be able to: <ol style="list-style-type: none"> <li>1. understand the basic definitions of antennas and antenna systems, including gain, directivity, polarization, array factor etc.</li> <li>2. make basic calculations of propagation loss, considering free-space loss and polarization effects.</li> <li>3. analyze the basic properties of a wire antennas.</li> <li>4. knowledge for the construction of loop antennas.</li> <li>5. analyze and calculate radiation patterns of the Array antenna.</li> <li>6. understand the principles of Loop, Helical and Yagi-Uda Antennas.</li> <li>7. design and analyze of Microstrip antenna.</li> </ol>
<b>Indicative Contents</b> المحتويات الإرشادية	This Course will cover: <ol style="list-style-type: none"> <li>1. Fundamentals of Antenna,</li> <li>2. Dipole Antennas and Monopole Antennas,</li> <li>3. Loop Antennas,</li> <li>4. Linear and Planar Arrays,</li> <li>5. Microstrip Antennas MSA,</li> <li>6. Helical Antennas and Yagi-Uda Antennas.</li> </ol>
<b>Course Description</b>	This course teaches the fundamentals of antenna and shows the application in practical examples. The course covers the theory of radiation, fundamental antenna parameters and concepts, wire antennas such as dipoles and loop antennas, antenna arrays, aperture antennas (e.g. horns), microstrip antennas

## Learning and Teaching Strategies استراتيجيات التعلم والتعليم

<b>Strategies</b>	The module will use a range of learning and teaching strategies, including: <ul style="list-style-type: none"> <li>- Lectures: To provide students with an overview of the main concepts and principles.</li> <li>- Assignments: To provide students with opportunities to apply their knowledge and skills to real-world problems.</li> </ul>
-------------------	--



### Student Workload (SWL) الحمل الدراسي للطلاب

Structured SWL (h/sem) الحمل الدراسي المنتظم للطلاب خلال الفصل	45	Structured SWL (h/w) الحمل الدراسي المنتظم للطلاب أسبوعياً	3
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطلاب خلال الفصل Library, dorm, home memorizing 25 Preparation for tests 15 HomeWorks 15	55	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطلاب أسبوعياً	3.6
Total SWL (h/sem) الحمل الدراسي الكلي للطلاب خلال الفصل	100		

### Module Evaluation تقييم المادة الدراسية

		Time (hr)	Weight (Marks)	Week Due	Relevant Learning Outcome
<b>Formative assessment</b>	Quizzes	2	25% (15)	5, 10, 12, 14	LO #1, 2, 6, 8, 9 and 10
	Assignments	6	15% (10)	2, 4, 6, 8, 10, 12	LO # 3, 4, 6, 8, 9, 10 and 11
	Lab	-	-	-	
<b>Summative assessment</b>	Midterm Exam	2hrs	10% (10)	7	LO # 1-4
	Final Exam	3hrs	50% (50)	16	All
<b>Total assessment</b>			100% (100 Marks)		

## Delivery Plan (Weekly Syllabus)

### المنهاج الاسبوعي النظري

	Material Covered
Week 1	Introduction to Antenna
Week 2	Fundamental Parameters: Radiation Pattern, Radiation Power Density, Radiation Intensity, and Beamwidth
Week 3	Fundamental Parameters: Polarization, Input Impedance, Antenna Radiation Efficiency, and Antenna Vector Effective Length and Equivalent Areas
Week 4	Sequential Logic System, Finite state machine, Moore FSM model, Mealy FSM model.
Week 5	Friis Transmission Equation
Week 6	Linear Wire Antennas: Infinitesimal Dipole, and Small Dipole
Week 7	Midterm I exam
Week 8	Linear Wire Antennas: Finite Length Dipole, and Half-Wavelength Dipole
Week 9	Dipole antenna on Infinite Perfect Conductors
Week 10	Loop Antennas
Week 11	Arrays antenna: Two-Element Array
Week 12	Arrays antenna: N-Element Linear Array:
Week 13	Arrays antenna: N-Element Linear Array: Directivity
Week 14	Microstrip Antennas
Week 15	Helical Antennas and Yagi-Uda Antennas
Week 16	Final Exam

## Learning and Teaching Resources

### مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Antenna Theory Analysis and Design, 4th edition, by: Constantine A. Balanis	Yes
Recommended Texts	Antenna Toolkit 2nd Edition, By: Joseph J. Carr, K4IPV	No
Websites		





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	Control systems		Module Delivery
Module Type	Core		Theory Lecture Lab Tutorial Practical Seminar
Module Code	ELEC-415		
ECTS Credits	5		
SWL (hr/sem)	125		
Module Level	4	Semester (s) offered	
Administering Department	Electrical Engineering	College	Engineering
Module Leader	Dr. Khalaf S Gaeid	e-mail	khalafgaeid@tu.edu.iq
Module Leader's Acad. Title	Professor	Module Leader's Qualification	Ph.D.
Module Tutor	None	e-mail	None
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	MATH-201	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

<b>Module Aims</b> أهداف المادة الدراسية	<ol style="list-style-type: none"> <li>The core course in electrical engineering introduces the fundamental concepts, principles and application of control system analysis and design to the undergraduate students.</li> <li>The course material 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.</li> <li>This course goes deeper into the various aspects of control engineering. Each topic is developed in logical progression with up-to-date information</li> </ol>
<b>Module Learning Outcomes</b> مخرجات التعلم للمادة الدراسية	<ol style="list-style-type: none"> <li>Interpret and analyze the control system.</li> <li>Apply the control system engineering algorithm to a range of electrical , mechanical systems designs</li> <li>Identify and formulate problems in electrical engineering and find appropriate solutions in both time domain and frequency domain</li> <li>Specify the most common classical control methods to achieve best design methods such as Nyquist ,Bode and Root locus</li> <li>Apply the control system algorithms to design real projects.</li> <li>Utilization of engineering software and hardware in problem solving in the control lab .</li> <li>To uphold the highest standards of integrity, responsible behavior, and ethical conduct in professional activities according to IEEE code 7.8.</li> </ol>
<b>Indicative Contents</b> المحتويات الإرشادية	<p>Indicative content includes the following.</p> <ul style="list-style-type: none"> <li>• Undergraduate Review (2 hrs)</li> <li>• Control systems transfer functions and Block diagram (16 hrs)</li> <li>• Frequency and Time domains (16 hrs)</li> <li>• Second order systems design (8 hrs)</li> <li>• Projects in control system engineering (3 hrs)</li> </ul>
<b>Course Description</b>	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

<b>Strategies</b>	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 In class lectures 65 In class tests 5 Seminars 4	74	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعياً	4.9
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل Library, dorm, home memorizing 21 Preparation for tests 20 Home works 10	51	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعياً	3.4
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	125		

### Module Evaluation تقييم المادة الدراسية

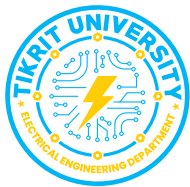
		Time (hr)	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	10% (10)	5, 10, 12, 14	LO #1, 2, 3, and 4
	Assignments	6	18% (18)	2, 4, 6, 8, 10, 12	LO # 1, 2, 3, 4, 5 and 6
	Seminars	3	12% (12)	-	
Summative assessment	Midterm Exam	2hrs	10% (10)	7	LO # 1-6
	Final Exam	3hrs	50% (50)	16	All
Total assessment			100% (100 Marks)		

### 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	<a href="https://ceng.tu.edu.iq/eed/">https://ceng.tu.edu.iq/eed/</a>	

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Safety , Responsibilities and rights: Safety and Risk – Assessment of Safety and Risk – Risk Benefit Analysis and Reducing Risk.
Week 2	Transfer functions of electrical system
Week 3	Transfer functions of mechanical-systems & servo systems
Week 4	Block diagram algebra
Week 5	Signal flow graph & Meason's rule.
Week 6	Time domain response
Week 7	Midterm exam
Week 8	Typical test signals-& types of the systems, the steady state error due to step ramp & parabolic inputs.
Week 9	Transient response of second order systems
Week 10	Stability of control system and Routh criterion,
Week 11	Root locus
Week 12	Frequency response
Week 13	Introduction to Nyquist plot, Nyquist plot, phase margin, gain margin
Week 14	Introduction to Bode diagram. Bode diagram
Week 15	Control Project
Week 16	Final Exam

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Lab 1: Transfer function of first and second order
Week 2	Lab 2: Block diagram algebra [series ,parallel, closed loop,feedback]
Week 3	Lab 3: Transient response of second order system
Week 4	Lab 4: Second-Order Transient Responses
Week 5	Lab 5: steady state error
Week 6	Lab 6: stability analysis
Week 7	Lab 7: root locus
Week 8	Lab 8: Nyquist and Bode



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	ADVANCE ENGINEERING Control		Module Delivery
Module Type	Core		Theory Lecture Lab Tutorial Practical Seminar
Module Code	ELEC-425		
ECTS Credits	5		
SWL (hr/sem)	125		
Module Level	4	Semester (s) offered	2
Administering Department	Electrical Engineering	College	Engineering
Module Leader	Dr. Khalaf S Gaeid	e-mail	khalafgaeid@tu.edu.iq
Module Leader's Acad. Title	Professor	Module Leader's Qualification	Ph.D.
Module Tutor	None	e-mail	None
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	MATH-415	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

<b>Module Aims</b> أهداف المادة الدراسية	<ol style="list-style-type: none"> <li>1. The core course in electrical engineering introduces the fundamental concepts, principles and application of control system analysis and design to the undergraduate students.</li> <li>2. The course material 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.</li> <li>3. This course goes deeper into the various aspects of control engineering. Each topic is developed in logical progression with up-to-date information.</li> </ol>
<b>Module Learning Outcomes</b> مخرجات التعلم للمادة الدراسية	<ol style="list-style-type: none"> <li>1. Interpret and analyze the control system practical consideration.</li> <li>2. Apply the control system engineering algorithm to design lead /lag compensation</li> <li>3. Identify and formulate problems in electrical engineering and find appropriate solutions using state space approach</li> <li>4. Specify the most common applications and design of PID controller</li> <li>5. Apply the control system algorithm's to analyze nonlinear system.</li> <li>6. Utilization of engineering software and hardware in problem solving in the control lab .</li> <li>7. To uphold the highest standards of integrity, responsible behavior, and ethical conduct in professional activities .</li> </ol>
<b>Indicative Contents</b> المحتويات الإرشادية	<p>Indicative content includes the following.</p> <ul style="list-style-type: none"> <li>• Practical consideration (2 hrs)</li> <li>• Control systems compensations and PID (16 hrs)</li> <li>• Nonlinear with describing function analysis (16 hrs)</li> <li>• State space with general solution (8 hrs)</li> <li>• Projects in control system engineering (3 hrs)</li> </ul>
<b>Course Description</b>	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

<b>Strategies</b>	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 In class lectures 65 In class tests 5 Seminars 4	74	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعياً	4.9
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل Library, dorm, home memorizing 21 Preparation for tests 20 Home works 10	51	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعياً	3.4
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	125		

### Module Evaluation تقييم المادة الدراسية

		Time (hr)	Weight (Marks)	Week Due	Relevant Learning Outcome
<b>Formative assessment</b>	Quizzes	2	10% (10)	5, 10, 12, 14	LO #1, 2, 3, and 4
	Assignments	6	18% (18)	2, 4, 6, 8, 10, 12	LO # 1, 2, 3, 4, 5 and 6
	Seminars	3	12% (12)	-	
<b>Summative assessment</b>	Midterm Exam	2hrs	10% (10)	7	LO # 1-6
	Final Exam	3hrs	50% (50)	16	All
<b>Total assessment</b>			100% (100 Marks)		

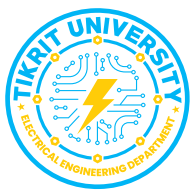
### Learning and Teaching Resources مصادر التعلم والتدريس

	Text	Available in the Library?
<b>Required Texts</b>	Control Systems Theory and Applications, Smarajit Ghosh, 2007 Dorling Kindersley (India) Pvt. Ltd, ISBN 9788131708286, eISBN 9789332506152	Yes
<b>Recommended Texts</b>	Modern Control Engineering Fifth Edition, Katsuhiko Ogata, 2010	Yes
<b>Websites</b>	<a href="https://ceng.tu.edu.iq/eed/">https://ceng.tu.edu.iq/eed/</a>	

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Safety , Responsibilities and rights : Employee Rights – Intellectual Property Rights (IPR) – Discrimination.
Week 2	Control system Components(Practical Considerations)
Week 3	Potentiometers, synchros, linear transducers, tachometers, accelerometers,
Week 4	Power actuators, AC servomotors, servomechanism
Week 5	Compensation (Lead, lag)
Week 6	lead - lag
Week 7	Three - term controller (PID)
Week 8	Midterm exam
Week 9	Non- linear control system
Week 10	(describing function approach).
Week 11	State space analysis
Week 12	State equation for dynamic system (electrical system), solving state equations
Week 13	Analogue computer
Week 14	Analogue computer
Week 15	Control Project
Week 16	Final Exam

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Lab 1: Compensation
Week 2	Lab 2: Three - term controller (PID)
Week 3	Lab 3: Three - term controller (PID)
Week 4	Lab 4: Non- linear control system
Week 5	Lab 5: Non- linear control system
Week 6	Lab 6: State space analysis
Week 7	Lab 7: Analogue computer
Week 8	Lab 8: Analogue computer





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	Computer Network		Module Delivery
Module Type	Elective		Theory Lecture Tutorial Practical Seminar
Module Code	ELEC-418		
ECTS Credits	4		
SWL (hr/sem)	100		
Module Level	4	Semester (s) offered	
Min number of students	15	Max number of students	100
Administering Department	Electrical Engineering	College	Engineering
Module Leader	ASMAA SALIH HAMMOODI	e-mail	Asmaa.s.hammodi@ tu.edu.iq
Module Leader's Acad. Title	Lecturer	Module Leader's Qualification	Ph.D.
Module Tutor	None	e-mail	None
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	ELECT-327	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

<b>Module Aims</b> أهداف المادة الدراسية	To help students gain comprehensive understanding of the three fundamental aspects of computer networks (Generation, Transmission, and Distribution), it is important to delve into practical terms and mathematical models associated with each component. This includes exploring various sources of network generation such as wired connections, wireless technologies, and hybrid solutions, as well as auxiliary sources like satellite communication and emerging technologies (e.g., Li-Fi). Similarly, an in-depth examination of network transmission lines is essential, encompassing concepts such as physical media (e.g., fiber-optic cables, copper wires), wireless channels (e.g., radio frequency spectrum), and network protocols (e.g., TCP/IP). Understanding the principles of network distribution involves exploring topics like routing algorithms, network topologies, and network management techniques. By comprehensively studying these aspects, students can acquire a robust knowledge base that covers both practical implementation and theoretical foundations of computer networks.
<b>Module Learning Outcomes</b> مخرجات التعلم للمادة الدراسية	<ol style="list-style-type: none"> <li>1. Understand the fundamental concepts and principles of computer networks, including protocols, architectures, and network layers.</li> <li>2. Identify and explain the different types of network topologies, such as bus, star, ring, and mesh.</li> <li>3. Describe the functions and features of networking devices, including routers, switches, and firewalls.</li> <li>4. Demonstrate knowledge of network addressing and subnetting, including IP addressing and subnet mask calculations.</li> <li>5. Analyze and troubleshoot common network connectivity issues using appropriate diagnostic tools.</li> <li>6. Design and implement local area networks (LANs) and wide area networks (WANs) based on specific requirements.</li> <li>7. Explain the concepts and mechanisms of network security, including authentication, encryption, and access control.</li> <li>8. Understand the principles and operation of wireless networks, including Wi-Fi standards and protocols.</li> <li>9. Apply network troubleshooting techniques to diagnose and resolve network performance problems.</li> <li>10. Demonstrate knowledge of network management concepts, including monitoring, configuration, and optimization.</li> </ol>
<b>Indicative Contents</b> المحتويات الإرشادية	<p>Indicative content includes the following.</p> <ul style="list-style-type: none"> <li>• introduction to Computer Networks:</li> <li>• Definition and importance of computer networks</li> <li>• Network architectures and protocols</li> <li>• OSI and TCP/IP network models</li> <li>• Different types of network topologies (e.g., bus, star, ring, mesh)</li> <li>• Wired and wireless network technologies (e.g., Ethernet, Wi-Fi)</li> <li>• Network Devices and Components:</li> <li>• Network interface cards (NICs) and modems</li> <li>• Network Addressing and Subnetting:</li> <li>• IP addressing and subnetting basics</li> <li>• Subnet mask calculations and subnetting techniques</li> <li>• Network Protocols and Services:</li> <li>• TCP/IP suite and its protocols (e.g., IP, TCP, UDP)</li> <li>• Application layer protocols (e.g., HTTP, DNS, FTP)</li> <li>• Network services such as DHCP, DNS, and NAT</li> </ul>
<b>Course Description</b>	This course on Computer Network provides students with a comprehensive understanding of modern networking principles, technologies, and practices. Topics covered include network architectures, protocols, IP addressing, subnetting, LAN and WAN technologies, network security, and network management. Students will gain practical skills in designing, configuring, and troubleshooting computer networks. Emerging network technologies, such as cloud computing and IoT, are also introduced. This course prepares students for careers in network administration and engineering.



## Learning and Teaching Strategies استراتيجيات التعلم والتعليم

<b>Strategies</b>	Strategies in a computer network course include lecture-based instruction, hands-on lab exercises, case studies and scenarios, group projects and collaboration, simulations and virtual labs, online resources and discussion forums, assessments and examinations, industry guest speakers and site visits, continuous feedback, and progress tracking, and staying updated with industry trends. These strategies aim to enhance understanding, promote practical skills, encourage critical thinking, foster collaboration, provide real-world perspectives, and ensure students stay engaged and up-to-date with network advancements.
-------------------	---

## Student Workload (SWL) الحمل الدراسي للطالب

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل In class lectures           38 In class tests                 2 Seminars                        2	45	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعياً	3
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل Library, dorm, home memorizing   20 Preparation for tests               20 Homeworks                         15	55	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعياً	3.66
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
<b>Formative assessment</b>	Quizzes	2	10% (10)	5, 10, 12, 14	LO #1, 2, 3, and 4
	Assignments (Homeworks)	5	10% (10)	2, 4, 6, 8, 10	LO # 1, 2, 3, 4, 5 and 6
	Seminars	4	8% (8)	Continuous	
	Discussions	6	12% (12)	Continuous	
<b>Summative assessment</b>	Midterm Exam	2hrs	10% (10)	7	LO # 1-5
	Final Exam	3hrs	50% (50)	16	All
<b>Total assessment</b>			100% (100 Marks)		

## Delivery Plan (Weekly Syllabus)

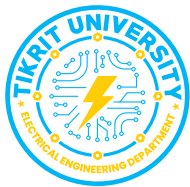
### المنهاج الاسبوعي النظري

Material Covered	
Week 1	Introduction to Computer Networks, Definition and importance of computer networks, Network architectures and protocols, OSI and TCP/IP network models
Week 2	
Week 3	Network Topologies and Technologies, Types of network topologies (e.g., bus, star, ring, mesh), Wired and wireless network technologies (e.g., Ethernet, Wi-Fi)
Week 4	Network Devices and Components, Routers, switches, hubs, and their functions, Network interface cards (NICs) and modems, Cables and connectors used in network installations
Week 5	Network Addressing and Subnetting, IP addressing fundamentals, Subnet masks and subnetting techniques, Address resolution protocols (ARP)
Week 6	
Week 7	Network Protocols and Services, TCP/IP suite and its protocols (e.g., IP, TCP, UDP), Application layer protocols (e.g., HTTP, DNS, FTP), Network services such as DHCP and DNS
Week 8	
Week 9	Network Security, Common network security threats and vulnerabilities, Authentication mechanisms and encryption techniques, Firewalls, VPNs, and intrusion detection systems (IDS)
Week 10	Local Area Networks (LANs), LAN technologies and standards (e.g., Ethernet, IEEE 802.11), LAN design considerations and network performance optimization, LAN troubleshooting and diagnostics
Week 11	Wide Area Networks (WANs), WAN technologies (e.g., leased lines, MPLS, VPNs), WAN connectivity options (e.g., T1, DSL, cable), WAN protocols (e.g., HDLC, PPP)
Week 12	
Week 13	Network Management, Network monitoring and troubleshooting tools, Configuration management and network optimization, Performance measurement and capacity planning
Week 14	
Week 15	Emerging Network Technologies, Cloud computing and virtualization, Internet of Things (IoT) and its impact on networks, Software-defined networking (SDN)
Week 16	Final Exam

## Learning and Teaching Resources

### مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	CCNA from CISCSCO	Yes
Recommended Texts	from CISCSCO	Yes
Websites		



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	Power system analysis		Module Delivery
Module Type	Core		Theory Lecture Lab Tutorial Practical Seminar
Module Code	ELEC-414		
ECTS Credits	5		
SWL (hr/sem)	125		
Module Level	4	Semester (s) offered	
Administering Department	Electrical Engineering	College	Engineering
Module Leader	Dr. Abdulsatar Hassan Jasim	e-mail	Abdulsatar62@tu.edu.iq
Module Leader's Acad. Title	Assist. Prof.	Module Leader's Qualification	Ph.D.
Module Tutor	None	e-mail	None
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	MATH-324	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

<b>Module Aims</b> أهداف المادة الدراسية	<p>A power system comprises of the various subsystems that include generation, transmission, and distribution. The goals of power system analysis are the following:</p> <ul style="list-style-type: none"> <li>To model or to execute per phase analysis of power system components</li> <li>To monitor the voltage at different buses, real and reactive power flow between buses</li> <li>To plan future expansion of the current system</li> <li>To analyze the system under different fault conditions and based on different Scenarios</li> <li>To investigate the stability of the system to handle small and large disturbances or faults of any kind.</li> </ul>
<b>Module Learning Outcomes</b> مخرجات التعلم للمادة الدراسية	<ul style="list-style-type: none"> <li>Understand and use one line diagram to represent power system also the student be able to draw impedance ,and reactance diagram by using per unit system.</li> <li>Student be able to calculate the symmetrical fault current ,also find the fault level. find the rupturing capacity of circuit breaker.</li> <li>Understand the concept of symmetrical component for analysis unbalanced power system.</li> <li>Demonstrate an understanding for unbalanced fault calculation.</li> <li>Student be able to investigate the stability of power system.</li> </ul>
<b>Indicative Contents</b> المحتويات الإرشادية	<p>Indicative content includes the following.</p> <ul style="list-style-type: none"> <li>Basic principles of one line diagram ,and per unit systems (6 hrs)</li> <li>Symmetrical fault calculation (9 hrs)</li> <li>Unsymmetrical fault calculation (9 hrs)</li> <li>Evaluate the equations of load flow problem and using GS method (6 hrs)</li> <li>Solution the equations of load flow problem by using NR method (6 hrs)</li> <li>Evaluate the equations of stability problem. (9 hrs)</li> <li>Apply mathematical principles to solve problems in power system analysis (15 hrs)</li> </ul>
<b>Course Description</b>	<p>This course aims to introduce the student to establish fundamental knowledge of the main technologies for the generation and transformation of electrical power with an emphasis on their operating principles, their stability when inter-connected and techniques for their control.</p>

## Learning and Teaching Strategies استراتيجيات التعلم والتعليم

<b>Strategies</b>	<p>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 simulation) examples Allow students adequate time to practice the techniques using a large number of carefully selected tutorial problems.</p>
-------------------	--



### Student Workload (SWL) الحمل الدراسي للطالب

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل In class lectures In class tutorials In class tests Seminars	59	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعياً	<b>3.93</b>
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل Library, dorm, home memorizing Preparation for tests Homeworks	66	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعياً	<b>4.4</b>
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	125		

### Module Evaluation تقييم المادة الدراسية

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

## Delivery Plan (Weekly Syllabus)

### المنهاج الاسبوعي النظري

	Material Covered
Week 1	Safety responsibility and rights-Respect for authority-Collective bargaining-Confidentiality
Week 2	One line diagram, Per unit system, reactance diagram, and impedance diagram
Week 3	Symmetrical fault calculation, three phase current limiting reactor design.
Week 4	Symmetrical component
Week 5	Unsymmetrical fault calculation
Week 6	Formation of admittance ,and impedance matrix
Week 7	Midterm exam
Week 8	Load flow problem
Week 9	Load flow analysis using GS method
Week 10	Load flow analysis using NR method in polar coordination.
Week 11	Load flow analysis using NR method in rectangular coordination.
Week 12	Stability of power system concept, and its types
Week 13	Swing equation, power angle equation of synchronous alternator with infinite system
Week 14	Equal area criterion for stability
Week 15	Enhancement stability of power system
Week 16	Final Exam

## Learning and Teaching Resources

### مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	john .J.Grainger wiliam D.stevenson "power system analysis" McGraw-Hill 1994 Hadi Saadat "power system analysis" McGraw-Hill 1999	Yes
Recommended Texts	J.D.Glover and Sarma. "power system analysis & design " PWS puplishing 1994 B.M.Weedy "Electric power system" 4 th editions john.wily & sons 1998 B.M.Weedy "Electric power system" 4 th editions john.wily & sons 1999 Mehta "principle of power system"	Yes
Websites		





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	Power system protection		Module Delivery
Module Type	Core		Lecture Tutorial
Module Code	ELEC-424		
ECTS Credits	4		
SWL (hr/sem)	100		
Module Level	4	Semester (s) offered	1
Administering Department	Electrical Engineering	College	Engineering
Module Leader	Dr. Abdulsatar Hassan Jasim	e-mail	Abdulsatar62@tu.edu. iq
Module Leader's Acad. Title	Assist. Prof.	Module Leader's Qualification	Ph.D.
Module Tutor	None	e-mail	None
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	ELEC-414	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

<b>Module Aims</b> أهداف المادة الدراسية	The objective of power system protection is to isolate a faulty section of electrical power system from rest of the live system so that the rest portion can function satisfactorily without any severer damage due to fault current To understand the importance of power system protection <ul style="list-style-type: none"> <li>• To identify the types of relays in power system and analyze them</li> <li>• To understand the earthing system and the associated types</li> <li>• To understand the components of power system and the mechanism of working</li> <li>• To choose the type of protection depending on equipment's.</li> <li>• To understand the work of protective devices coordination</li> <li>• To understand the application of the standard IEC 61850</li> </ul>
<b>Module Learning Outcomes</b> مخرجات التعلم للمادة الدراسية	At the end of the module, students will be able to: <ul style="list-style-type: none"> <li>• Study the power system protection</li> <li>• Determine of the setting of relays in the power system</li> <li>• Choose the appropriate protection devices</li> <li>• Coordinate of protection working in the power systems</li> <li>• Study and select the appropriate earthing systems</li> </ul>
<b>Indicative Contents</b> المحتويات الإرشادية	Indicative content includes the following. <ul style="list-style-type: none"> <li>• Basic principles of protection system ( 6hrs)</li> <li>• Types of relays ( 6 hrs)</li> <li>• Types of protection systems (18 hrs)</li> <li>• Applications of protection system ( 9 hrs)</li> <li>• Apply mathematical principles to solvel problems in protection systems (15 hrs)</li> </ul>
<b>Course Description</b>	Electric power systems are becoming increasingly complex in nature due to the integration of distributed energy resources. This module covers introduction to power system protection, which is a branch of electrical power engineering that deals with the protection of electrical power systems from defining the faults through the isolation of this fault. The objective of a power system protection is to keep the power system stable by isolating only the components that are under fault, whilst leaving as much of the network as possible still in operation. Thus, protection schemes must apply a very pragmatic and pessimistic approach to clearing system faults. The protection devices that are used to protect the power systems from faults. This module includes introduces the fundamentals of power system protection.. After that, the components of protection system will be explained. The coordination and management of the protection devices will be presented . the schemes of protection of power system components will be reviewed.

## Learning and Teaching Strategies استراتيجيات التعلم والتعليم

<b>Strategies</b>	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 simulation) 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 In class lectures           28 In class tutorials           14 In class tests                 3	45	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعياً	3
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل Library, dorm, home memorizing   22 Preparation for tests               20 Homeworks                         13	55	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعياً	3.6
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
<b>Formative assessment</b>	Quizzes	3	15% (15)	5, 10, 13	LO #1, 2, 3, and 4
	Assignments	4	10% (10)	3,6, 11,14	LO # 1, 2, 3, 4, 5 and 6
	Small project	1	10% (10)	Continuous	
	Report	1	5% (5)	13	LO # 1, 2, 5 and 6
<b>Summative assessment</b>	Midterm Exam	2hrs	10% (10)	7	LO # 1-3
	Final Exam	3hrs	50% (50)	16	All
<b>Total assessment</b>			100% (100 Marks)		

## Delivery Plan (Weekly Syllabus)

### المنهاج الاسبوعي النظري

	Material Covered
Week 1	Fundamental of power system protection • Need for protection • Characteristics of a good protection : Components of protection systems • Protection zones
Week 2	Instrument transformers: CT and VT • Circuit breakers: types and comparison of CB types •
Week 3	Types of relays
Week 4	Static and digital relay
Week 5	Primary and backup protection, coordination of protection relays
Week 6	Adaptive protection for smart grid
Week 7	Midterm exam
Week 8	Overcurrent protection
Week 9	Differential protection
Week 10	Distance protection
Week 11	Generator and motor protections,
Week 12	Transformer, and Switchgear protection
Week 13	Transmission line protections
Week 14	Protection against high voltages
Week 15	Earthing systems
Week 16	Final Exam

## Learning and Teaching Resources

### مصادر التعلم والتدريس

	Text	Available in the Library?
<b>Required Texts</b>	Paul M. Anderson, Charles and etal :Power System Protection: Willy 2021	Yes
<b>Recommended Texts</b>	<ol style="list-style-type: none"> <li>1. Hasan Can Kiliçkiran,,and etal "Power system protection with digital overcurrent relays: A review of non-standard characteristics" Electric PowerSystems Research, Volume 164, November 2018, Pages 89-102 2.</li> <li>2. Mason, C. Russell. "The Art and Science of Protective Relaying"(PDF). General Electric. Retrieved 2009-01-26.</li> <li>3. Xavier Vallvé, TramaTecnoAmbiental, " Earthing and lightning overvoltage protection for pv plants" United Nations Development Programme, www.lb.undp.org 2013..</li> <li>4. B.M.Weedy "Electric power system" 4 th editions john.wily &amp; sons 1999</li> <li>5. Mehta "principle of power system"</li> </ol>	Yes
<b>Websites</b>		

**Tikrit University**  
Electrical Engineering

---

