Ministry of Higher Education and
Scientific Research - Iraq
Northern Technical University
Engineering Technical College/Mosul
Department of Electrical Engineering Techniques

MODULE DESCRIPTOR FORM

نموذج وصف المادة الدراسية

Module Information

معلومات المادة الدراسية

Module Title	**DC ELECTRICAL CIRCUITS**	**Module Delivery**	
Module Type	CORE	✓ **Theory**	
Module Code	EET100	**Lecture**	
ECTS Credits	8	✓ **Lab**	
SWL (hr/sem)	200	**Tutorial**	
		Practical	
		✓ **Seminar**	

Module Level	1	**Semester of Delivery**	1
Administering Department	DEPARTMENT OF ELECTRICAL ENGINEERING TECHNIQUES	**College**	NORTHERN TECHNICAL UNIVERSITY ENGINEERING TECHNICAL COLLEGE/MOSUL
Module Leader	Alya Hamid Ali	**e-mail**	alya.hamid@ntu.edu.iq
Module Leader's Acad. Title	Assist. Professor	**Module Leader's Qualification**	Master
Module Tutor	None	**e-mail**	None
Peer Reviewer Name	None	**e-mail**	None
Review Committee Approval	14/06/2023	**Version Number**	1.0

Relation With Other Modules

العلاقة مع المواد الدراسية الأخرى

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

Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

Module Objectives أهداف المادة الدراسية	1-Understanding the Fundamentals: The primary objective of a DC circuits course is to provide students with a solid foundation in the fundamental principles of direct current (DC) circuits. This includes concepts such as voltage, current, resistance, Ohm's law, power, and energy. 2-Analyzing Circuit Components: Students will learn how to analyze and work with various circuit components. They will understand their behavior in DC circuits and be able to calculate their effects on voltage, current, and power. 3-Circuit Laws and Theorems: Students will become familiar with important laws and theorems governing DC circuits, including Ohm's law, Kirchhoff's laws (KCL and KVL), Thevenin's theorem, Norton's theorem, and maximum power transfer theorem. They will gain proficiency in applying these principles to solve complex circuit problems. 4-Circuit Simulation and Design: The course may involve introducing students to circuit simulation software. They will learn how to use simulation tools to analyze and design DC circuits, verify their calculations, and gain practical insights into circuit behavior. 5-Problem-Solving Skills: An important objective is to develop students' problem-solving skills in the context of DC circuits. They will learn how to analyze circuit diagrams, formulate appropriate strategies, and apply their knowledge to solve a variety of circuit problems efficiently.

	6-Laboratory Skills: The course includes hands-on laboratory experiments to provide students with practical experience in building, testing, and troubleshooting DC circuits.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1-Fundamental Knowledge: Students will acquire a solid understanding of the fundamental concepts and principles of direct current (DC) circuits, including voltage, current, resistance, power, and energy. 2-Circuit Analysis Skills: Students will develop the ability to analyze DC circuits using various techniques such as applying Kirchhoff's laws, performing nodal and mesh analysis, and utilizing circuit theorems like Thevenin's and Norton's theorem. They will gain proficiency in solving complex circuit problems and calculating circuit parameters. 3-Circuit Design and Simulation: Students will be able to design and simulate DC circuits, using appropriate components and considering design constraints. They will learn to use circuit simulation software to verify their designs, analyze circuit performance, and troubleshoot circuit issues. 4-Laboratory Skills: Through hands-on laboratory experiments, students will develop practical skills in building, testing, and troubleshooting DC circuits. They will become proficient in using measuring instruments, interpreting experimental data, and ensuring safety precautions while working with electrical circuits. 5-Critical Thinking and Analysis: The course will promote critical thinking and analytical skills among students. They will learn to evaluate different circuit solutions, analyze circuit behavior, and make informed decisions based on their understanding of DC circuits. By the end of the course, students will possess a comprehensive knowledge of DC circuits, enabling them to analyze, design, and troubleshoot a wide range of electrical circuits. They will be prepared for further studies in electrical engineering or related fields and equipped with skills that can be applied in professional practice.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following: • Part A – General Electric System. Constituent parts of an electrical system (source, load, communication & control), Current flow in a circuit, Electromotive force and potential difference, Electrical units. Ohm's law, Resistors, Resistivity, Temperature rise & Temperature coefficient of resistance, Voltage & Current sources [8 hrs] • Part B DC circuits. Series circuits, Parallel circuits. Kirchhoff's laws. Power and energy [14 hrs] • Part C Network Theorems . Star-delta & delta-star transformation. Sources transformations Mesh analysis. Nodal analysis. Superposition theorem. Thevnin's theorem. Norton's theorem. Maximum power transfer theorem. [32 hrs] • Revision problem classes [6 hrs]

Learning and Teaching Strategies
استراتيجيات التعلم والتعليم

Strategies	1-**Hands-on Experiments:** Engage students in practical experiments to deepen their understanding of circuits. 2-**Simulation Software:** Use circuit simulation software for virtual circuit design and analysis. 3-**Problem-solving Exercises:** Include various problem-solving exercises to apply circuit analysis techniques. 4-**Group Projects:** Assign collaborative projects for circuit design and construction. 5-**Real-world Applications:** Discuss practical applications of circuits in different devices and systems. 5-**Interactive Discussions:** Encourage student participation and critical thinking

	through open-ended questions. 6-**Conceptual Understanding:** Focus on intuitive understanding alongside mathematical analysis. 7-**Assessment Variety:** Use diverse assessment methods to gauge student understanding. 8-**Office Hours and Support:** Offer individualized assistance through office hours or online support.

Student Workload (SWL)
الحمل الدراسي للطالب

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	93	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	6.12
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	107	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	7.13
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	200		

Module Evaluation
تقييم المادة الدراسية

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

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
1	**Fundamental electric quantities: voltage, current, power and energy**
2	• **Resistance, capacitance and inductance** **Dependent and Independent source.**
5	• **Series and parallel resistors** **voltage and current division**
6	**Kirchhoff's laws (KVL & KCL).**
7	**• Conversion of delta-connected resistance into an equivalent Wye connection & vice versa.**
8,9,10	• **Mesh analysis** **Node analysis**
11	• **Superposition's theorem.**
12,13	• **Thevenin's theorem** **Norton's theorem.**
14	• **Maximum power transfer.**
15	**• Final Examination**

Delivery Plan (Weekly Lab. Syllabus)
المنهاج الاسبوعي للمختبر

	Material Covered
1	**Introduction to Measurement Devices**

2	**Color of Resistance**
3,4	**Ohm's Law and Resistance in Series and Parallel**
5,6	**Star& Delta Connection**
7	**Kirchhoff's Law**
8	**MID-TERM EXAM**
9,10	**Super Position Theorem**
11,12	**Thevenin's Theorem**
13,14	**Norton's Theorem & Maximum Power Transfer**
15	Review

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Charles K. Alexander, Matthew N.O. Sdiku Fundamentals of Electrical Engineering, 4th Edition, 2009	Yes
Recommended Texts	Tony R. Kuphaldt, Lessons In Electric Circuits, Volume I - DC 5th edition, Pearson Education 2002	No
Websites	Direct Current (DC) https://www.allaboutcircuits.com/textbook/direct-current/	

APPENDIX:

GRADING SCHEME
مخطط الدرجات

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

Note:

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

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MODULE DESCRIPTOR FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**DIGITAL TECHNOLOGIES**			**Module Delivery**	
Module Type	**Core**			✓ **Theory** **Lecture** ✓ **Lab** **Tutorial** **Practical** ✓ **Seminar**	
Module Code	**EET101**				
ECTS Credits	**6**				
SWL (hr/sem)	**150**				
Module Level	1		**Semester of Delivery**	1	
Administering Department	Department of Electrical Engineering Techniques		**College**	Northern Technical University Engineering Technical College/Mosul	
Module Leader	Hiba-allah tariq		**e-mail**	hibatallahtariq@ntu.edu.iq	
Module Leader's Acad. Title	Assist. Lect.		**Module Leader's Qualification**	M.Sc.	
Module Tutor	None		**e-mail**	None	
Peer Reviewer Name	None		**e-mail**	None	
Scientific Committee Approval Date	01/06/2023		**Version Number**	1.0	

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

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	**1-Training students on the basics of logical circuits used in electronic computers and how they work.** **2- Building logical circuits and learning about computer operation.**
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Learning about the different number systems. 2. Learning the arithmetic operations related to different number systems. 3. Learning the different logic gates of computer system and their work. 4. Ability to design, simplify and implement different logical and arithmetic circuits that considered the basic of digital system. 5. Ability to design, simplify and implement different sequential circuits, counters and shift registers.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following: • Part 1 – Numbers Systems, Operations, and Codes Different Number Systems, Data representation (integer and fraction) using different number systems. Conversion Between Different Numbers Systems. Arithmetic operations using different number systems, and Digital Codes (BCD, Parity, Gray, etc.) [10 hrs] • Part 2- Logic Gates The Inverter (NOT Gate), AND Gate, OR Gate, NAND Gate, NOR Gate, the Exclusive-OR Gate and Exclusive-NOR Gates. [8 hrs] • Part 3 Boolean Algebra and Logic Simplification Boolean Operations and Expressions, Laws and Rules of Boolean Algebra, Simplification Using Boolean Algebra, DeMorgan's theorems,The Karnaugh Map (1, 2 , 3 and 4 variables) , SOP and POS Minimization. [8 hrs] • Part 4 Combinational Logic Analysis Basic Combinational Logic Circuits, Implementing Combinational Logic, Combinational Logic Using NAND and NOR Gates, Logic Circuit Operation with Pulse Waveform Inputs. [10 hrs] Revision problem classes [10 hrs] • Part 5 – Functions of Combinational Logic. Half , Full and Parallel Binary Adders and Subtractors. 1's and 2's Complement Subtractor, 2's Complement Adder-Subtractor, BCD Adder, etc. Comparators, Decoders, Encoders, Multiplexers, Demultiplexer [10 hrs] • Part 6- Latches, Flip-Flops, and Timers. Latches, Edge-Triggered Flip-Flops. Flip-Flop operating (R-S, T, J-K ,D) [12 hrs] • Part 7Counters Synchronous Counters, Asynchronous Counters. Design of Counters. [8 hrs] • Part 8 Shift Registers Basic Shift Register Operations: SISO, SIPO, PISO, PIPO, Bidirectional and special Types Shift Register. [6 hrs] • Revision problem classes [6 hrs] • Part 9– Microprocessor Introduction to Microprocessor: component of microprocessor, Microprocessor architecture [6 hrs]

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

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	**93**	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	**6.2**
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	**57**	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	**3.8**
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**150**		

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

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Introduction - Difference between Circuit Theory and Field Theory
Week 1	• **General number formula: Binary, octal, decimal and hexadecimal numbers**
Week 2	• **Arithmetic operations in different number system**
Week 3	• **complements, binary codes, BCD, Ex-3, Gray codes**
Week 4	• **Basic definitions, basic theorem and properties, Boolean functions**
Week 5	• **Canonical and Standard forms Digital Logic Gates**
Week 6	• **Karanough Maps: AND- OR implementation, don't care conditions**
Week 7	• **Subtractions, half and full adders and subtractions, binary parallel address**
Week 8	• **decoders, encoders, comparators**
Week 9,10	• **multiplexers and demultiplexers**
Week 11	• **Flip-flops (RS, T, D, JK …)** • **Master slave FF, counter** • **shift registers**
Week 12,13	• **Introduction to Microprocessor** • **Microprocessor architecture**
Week 14	• **component of microprocessor**
Week 15	• **Final Examination**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	• **Lab 1: Introduction to digital laboratory kit operation** • **Lab 2: Logic Gates (AND, OR, NOT, NAND, NOR).**
Week 2	• **Lab 3: Logic Gates (XOR, XNOR).** • **Lab 4: De Morgan's Theorems** 1^{st} and 2^{nd} Laws.
Week 3	• **Lab 5: Designing a combinational Logic circuit.** • **Lab 6: The realization of the Boolean equation.**
Week 4	• **Lab 9: Half Binary Subtractor.** • **Lab 10: Full Binary Subtractor.**
Week 5	• **Lab 11:Binary comparator**
Week 6	• **Lab 12: 2's Complement Adder- Subtractor**
Week 7	• **Lab 13: Flip-Flop.**

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Thomas L. Floyd, Digital Fundamentals, 11th Edition, Pearson Education 2015	Yes

Recommended Texts	1- Introduction to Digital Logic with Laboratory Exercises/James Feher, 2009. 2- M. Morris Mano, Michael D. Ciletti, Digital Design, 5th edition, Pearson Education 2013.	No
Websites	Digital Systems: From Logic Gates to Processors: https://www.coursera.org/learn/digital-systems	

Grading Scheme
مخطط الدرجات

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

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

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MODULE DESCRIPTOR FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**ENGINEERING DRAWING**			**Module Delivery**	
Module Type	**Basic**			**Theory** **Lecture** **☒Lab** **☐Tutorial** **☐Practical** **☒Seminar**	
Module Code	**EET102**				
ECTS Credits	**5**				
SWL (hr/sem)	**125**				
Module Level	1		**Semester of Delivery**	1	
Administering Department	Electrical Engineering Techniques		**College**	Engineering Technical College/Mosul	
Module Leader	Fatin M. shehab		**e-mail**	fatin.m.alobaid@ntu.edu.iq	
Module Leader's Acad. Title	Lecturer		**Module Leader's Qualification**	M.Sc.	
Module Tutor	None		**e-mail**	E-mail	
Peer Reviewer Name	None		**e-mail**	E-mail	
Scientific Committee Approval Date	01/06/2023		**Version Number**	1.0	

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

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	1. To explore further and confirm the reference of engineering drawing to the varied design applications found in engineering and technology in general. 2. To further the ability to communicate information by engineering drawings. 3. To develop knowledge to two dimensional (2D) computer-aided drawing(CAD). n Further and/or Higher Education who are required to learn how to use the computer-aided design (CAD) software package AutoCAD®
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Learning types of engineering lines and their uses and how to draw 2. Drawing geometric shapes such as square, rectangular, parallelogram and circle 3.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following: ● Part A – AutoCAD interface Setup, save, limits, grid, object snap and ortho mode [3 hrs.] ● Part B- Coordinate method Direct distance method, Absolute coordinate, Relative coordinate, Polar coordinate[3hrs] ● Part C Draw menu Line, polyline, rectangle, arc, circle, ellipse and hatch [12hrs] ● Part D Modify and Properties menu Copy, move, offset, erase, extend, trim and array, line shape and line size [9 hrs.] ● Part D Projection Front, side and top ortho projections [6 hrs.] ● Part E stereoscopic shapes Method for drawing stereoscopic shapes[6hrs] Revision problem classes [8 hrs.]

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

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	63	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4.2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	62	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	4.13
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**125**		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	4	10% (10)	5 and 10	LO #1, #2
	Assignments	8	10% (10)	2 and 12	LO #3
	Projects / Lab.	18	10% (10)	Continuous	All
	Report	0	10% (10)		
Summative assessment	**Midterm Exam**	2hr	10% (10)	7	LO #1 - 3
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
1	**Introducing AutoCAD**
2	**Drawing settings**
3 ,4 ,5 ,6	**Drawing Tools:** **Line, Circle, Arc, Ellipse, Donut, Polygon, Rectangle, Point, Multiline, Pline, Spline, Xline.**
7 ,8, 9	**Modify Tools** **Erase, Undo, Redo, Explode, Move, Copy, Rotate, Mirror, Array, Align, Scale, Stretch, Lengthen, Trim, Extend, Break, Join, Chamfer, Fillet.**
10	**Display Control: Zoom, Pan, Redraw, Clean Screen.**

11	**Dimension - Linear, Aligned, Radius, Diameter, Center Mark, Angle, Arc length, Continuous, Baseline, Tolerance, Dimension Space, Dimension Break, Jogged radius, Ordinate dimensions.**
12	**Annotation Tools** **Text, Style, Mtext, Scale text, Spell,**
13	**Hatching Objects**
14	**Exercises drawing**
15	**Final Examination**

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	ENGINEERING GRAPHICS FOR First Year Student Specialized Scientific Programs (SSP) Faculty of Engineering Alexandria University Prepared By Assoc. Prof. / Raafat El sayed Shaker Ismail Introduction to AutoCAD 2011. 2D and 3D Design by Alf Yarwood	Yes
Recommended Texts	DC Electrical Circuit Analysis: A Practical Approach Copyright Year: 2020, dissidents.	No
Websites	https://www.coursera.org/browse/physical-science-and-engineering/electrical-engineering	

Grading Scheme
مخطط الدرجات

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

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Department of Electrical Engineering techniques

MODULE DESCRIPTOR FORM

نموذج وصف المادة الدراسية

Module Information

معلومات المادة الدراسية

Module Title	**ENGINEERING MATHEMATICS**	**Module Delivery**	
Module Type	BASIC	✓ **Theory** **Lecture** **Lab** ✓ **Tutorial** **Practical** ✓ **Seminar**	
Module Code	EET103		
ECTS Credits	6		
SWL (hr/sem)	150		
Module Level	1	**Semester of Delivery**	1
Administering Department	**DEPARTMENT OF ELECTRICAL ENGINEERING TECHNIQUES**	**College**	**NORTHERN TECHNICAL UNIVERSITY ENGINEERING TECHNICAL COLLEGE/MOSUL**
Module Leader	Sanabel muhson	**e-mail**	Sanabel.m.mohammed@ntu.edu.iq
Module Leader's Acad. Title	Ass.prof.	**Module Leader's Qualification**	M.Sc.
Module Tutor	None	**e-mail**	None
Peer Reviewer Name	None	**e-mail**	None
Review Committee Approval	21/06/2023	**Version Number**	1.0

Relation With Other Modules

العلاقة مع المواد الدراسية الأخرى

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

Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

Module Objectives أهداف المادة الدراسية	**To teach the students:** 1-Derivatives of trigonometric functions 2- Partial differentiation and Total differential 3- limit and derivative concepts 4- The Fundamental Theorem of Calculus, 5-Indefinite Integrals and the Net Change Theorem.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Learning about the complex numbers. 2. Learning the Functions of several variables. 3. Learning the Lines and planes in space, Tangent and normal in the plane 4. Learning the Triple integrals in rectangular coordinates 5. Double Integral in rectangular and polar form, Areas and volumes 6. Applications (Surface Area, Green's theorem and Stokes' theorem
Indicative Contents المحتويات الإرشادية	Indicative content includes the following: ❖ Complex Numbers– For most students the assumptions I've made above about their exposure to complex numbers is the extent of their exposure. Problems tend to arise

	however because most instructors seem to assume that either students will see beyond this exposure in some later class or have already seen beyond this in some earlier class. Students are then suddenly expected to know more than basic arithmetic of complex numbers but often haven't actually seen it anywhere and have to quickly pick it up on their own in order to survive in the class. [13 hrs] ❖ Vector Fields – In this section we introduce the concept of a vector field and give several examples of graphing them. We also revisit the gradient that we first saw a few chapters ago. Line Integrals – Part I – In this section we will start off with a quick review of parameterizing curves. This is a skill that will be required in a great many of the line integrals we evaluate and so needs to be understood. We will then formally define the first kind of line integral we will be looking at : line integrals with respect to arc length. Line Integrals – Part II – In this section we will continue looking at line integrals and define the second kind of line integral we'll be looking at : line integrals with respect to x, y, and/or z. We also introduce an alternate form of notation for this kind of line integral that will be useful on occasion. Line Integrals of Vector Fields – In this section we will define the third type of line integrals we'll be looking at : line integrals of vector fields. We will also see that this particular kind of line integral is related to special cases of the line integrals with respect to x, y and z. [20 hrs] ❖ Part D: Multiple Integrals - In this chapter will be looking at double integrals, i.e. integrating functions of two variables in which the independent variables are from two dimensional regions, and triple integrals, i.e. integrating functions of three variables in which the independent variables are from three dimensional regions. Included will be double integrals in polar coordinates and triple integrals in cylindrical and spherical coordinates and more generally change in variables in double and triple integrals.[20 hrs] ❖ Revision problem classes [6 hrs]

Learning and Teaching Strategies
استراتيجيات التعلم والتعليم

Strategies	The main strategy that will be adopted in the delivery of this unit is to encourage students to participate in exercises, while improving and expanding their mathematical reasoning skills.

Student Workload (SWL)
الحمل الدراسي للطالب

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	93	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	6.2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	57	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	3.8
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	150		

Module Evaluation
تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	5	10% (10)	4,6 ,8,10,11	LO #1, 2, and 4
	Assignments	12	10% (10)	Continuous	All

	Projects / Lab.	0	0		
	Report	0	0		
Summative assessment	**Midterm Exam**	2 hr	20% (20)	8	LO # 1-6
	Final Exam	3 hr	60% (60)	15	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
Week 1	**Equation of the straight line, Trigonometric functions and their sketches. Domain, Range, Inverse of functions, Absolute value, limits, Limits applications, Polar coordinates, Conic sections**
Week 2	**Differential calculus: Methods of differentiation, Some applications of differentiation**
Week 3	**Derivatives of trigonometric functions, inverse trigonometric**
Week 4	**Partial differentiation, Total differential, rates of change and small changes Maxima, minima and saddle points for functions of two variables**
Week 5	**Theory of matrices and determinants. Properties of matrix operations, matrix transpose, matrix inverse, Applications to linear equations, Cramer's Rule. Eigen values and eigenvectors**
Week 6	**Derivatives of Logarithmic and exponential functions**
Week 7	**Hyperbolic functions, Relation between the hyperbolic functions and exponential functions**
Week 8	**Derivative of hyperbolic functions**
Week 9	**Sigma Notation, Areas and Distances, The Definite Integral. The Fundamental Theorem of Calculus, Indefinite Integrals and the Net Change Theorem, The Substitution Rule**
Week 10	**Trigonometric Integrals, Trigonometric Substitution, Partial Fractions and Improper Integrals**
Week 11,12	**Integration using Tables and Computer Algebra Systems CAS, Numerical Integration (Trapezoidal Approximation, Midpoint Approximation, Simpson's Approximation, and Error Bounds)**
Week 12	**Areas between Curves, Volume, Volumes by Cylindrical Shells Average Value of a Function (Mean Value Theorem), Arc Length**
Week 13	**Applications to Physics and Engineering and Probability**
Week 14	**Final exam**

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	**Available in the Library?**
Required Texts	**Advance Engineering Mathematics, Alan Jeffrey, 2002**	Yes
Recommended Texts	**Calculus II &Calculus III, Paul Dawkins, 2007**	No
Websites	https://tutorial.math.lamar.edu/Classes/CalcIII/CalcIII.aspx https://tutorial.math.lamar.edu/Classes/CalcII/CalcII.aspx	

APPENDIX:

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

Note:

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

Ministry of Higher Education and Scientific Research - Iraq
Northern Technical University
Engineering Technical College/Mosul
Department of Electrical Engineering Techniques

MODULE DESCRIPTOR FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Engineering Mechanics**			**Module Delivery**	
Module Type	**Core**			☒ **Theory**	
Module Code	**EET104**			☒ **Lecture**	
ECTS Credits	**6**			☐ **Lab**	
SWL (hr/sem)	**150**			**Tutorial** ☐ **Practical** ☒ **Seminar**	
Module Level	1		**Semester of Delivery**	2	
Administering Department	Electrical Engineering Techniques		**College**	Engineering Technical College	
Module Leader	**Fatin M. Shehab**		**e-mail**	fatin.m.alobaid@ntu.edu.iq	
Module Leader's Acad. Title	**Lecturer**		**Module Leader's Qualification**	MASTER	
Module Tutor	**Fatin M. Shehab**		**e-mail**	E-mail	
Peer Reviewer Name	None		**e-mail**	None	
Scientific Committee Approval Date	June /01/2023		**Version Number**	1.0	
Relation with other Modules العلاقة مع المواد الدراسية الأخرى					
Prerequisite module	None		**Semester**		
Co-requisites module	None		**Semester**		

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	Module Objectives for Engineering Mechanics/Statics: 1. Understand the fundamental concepts and principles of Statics, including motion, forces, and acceleration. 2. Apply kinematic equations to analyze the motion of particles and rigid bodies in various scenarios. 3. Determine the relationship between forces, mass, and acceleration using Newton's laws of motion.

	4. Apply the principles of work and energy to analyze and solve dynamic problems. 5. Analyze and calculate linear and angular momentum, and apply the principle of impulse and momentum to dynamic systems. 6. Understand and apply the principles of vibrations and oscillations in mechanical systems.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Apply fundamental concepts of engineering mechanics/statics to analyze and solve problems related to the equilibrium of rigid bodies. 2. Demonstrate a deep understanding of vector mathematics and its application in statics, including vector addition, subtraction, dot product, and cross product. 3. Apply the principles of static equilibrium to solve problems involving forces and moments acting on rigid bodies in two and three dimensions. 4. Analyze and calculate the internal forces, such as axial forces, shear forces, and bending moments, in statically determinate structures using methods such as the method of sections and the method of joints. 5. Utilize free-body diagrams to model and analyze the forces acting on a structure or a rigid body, and determine the resultant forces and moments at specific points. 6. Analyze and calculate the centroid and moment of inertia of various two-dimensional shapes, including rectangles, triangles, and circles, and apply these concepts to determine the stability and strength of structures. 7. Apply the concepts of friction and its effects on the equilibrium of bodies in statics, including calculating static and kinetic friction forces and determining the angle of friction. 8. Analyze and calculate the forces in trusses and frames, including the method of joints and the method of sections, and determine the stability and structural integrity of these systems. 9. Apply the principles of equilibrium to solve real-world engineering problems, such as determining the stability of structures, calculating the forces on supports and connections, and analyzing the behavior of mechanical systems. 10. Communicate effectively, both orally and in writing, to present and explain the analysis, results, and solutions of engineering mechanics/statics problems. By achieving these module learning outcomes, students will develop a strong foundation in engineering mechanics/statics and be equipped with the necessary knowledge and skills to analyze and solve a wide range of engineering problems involving static equilibrium and structural stability.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. 1. Introduction to Statics • Definition and scope of statics • Fundamental concepts and principles • Importance of statics in engineering 2. Vectors and Vector Analysis • Vector representation and operations • Vector components and coordinate systems

	• Vector addition, subtraction, and scalar multiplication 3. Forces and Moments • Forces and their characteristics • Resultant and equilibrium of forces • Moment of a force and its properties • Couples and their effects 4. Equilibrium of Rigid Bodies • Free body diagrams and force analysis • Equations of equilibrium in two and three dimensions • Solving equilibrium problems using scalar and vector approaches • Applications to simple systems and structures 5. Truss Structures • Introduction to truss analysis • Method of joints and method of sections • Determination of member forces and support reactions 6. Friction • Laws of friction and frictional forces • Types of friction and their characteristics • Calculation of frictional forces and moments • Applications to inclined planes, wedges, and screws 7. Center of Gravity and Centroids • Definitions and properties of center of gravity and centroids • Determination of center of gravity and centroids of simple shapes • Composite bodies and distributed loads 8. Moments of Inertia • Moment of inertia and its physical significance • Calculating moments of inertia for simple shapes • Parallel-axis and perpendicular-axis theorems • Application of moments of inertia in engineering analysis

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

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	48	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	3.2

Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	102	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	6.8
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**175**		

Module Evaluation

تقييم المادة الدراسية

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

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
1	• Static science – Definitions
2	• Forces ,Curers (bi-axis)
3	•Force components
4,5	•Composition •Resolution of forces
6,7	•Moment of a force
8	•Coupling
9	Equilibrium of planar forces
10	•Free-body diagram
11,12	•Centroid & center of gravity (for area & bodies)
13	•Moment of inertia
14	•Direct stress & direct strain and their relation •Shearing forces and bending moment ،s diagrams.
15	• Final Examination

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Engineering Mechanics/ Statics, Fourteen Edition, R.C. Hibbeler	yes

	Engineering Mechanics Volume 1 Statics Seventh Edition J. L. Meriam L. G. Kraige Virginia Polytechnic Institute and State Universit Engineering Mechanics, Lectures, Notes and Solutions, University of AL Qadisiyah Roads & Transport Department by Alaa J. Alnsrawy	
Recommended Texts	1- Engineering Mechanics , Ferdinand L. Singer 2- Engineering Mechanics, Meriam 3- Engineering Mechanics/ Statics, Arthur P. Boresi & Richard J. Schmidt	No
Websites		

Grading Scheme

مخطط الدرجات

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

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

Ministry of Higher Education and
Scientific Research - Iraq
Northern Technical University
Engineering Technical College/Mosul
Department of Electrical Engineering Techniques

MODULE DESCRIPTOR FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	ENGINEERING WORKSHOPS			**Module Delivery**	
Module Type	**Basic**			**Theory** **Lecture** ✓ **Lab** ☐**Tutorial** ✓ **Practical** ✓ **Seminar**	
Module Code	**EET105**				
ECTS Credits	**5**				
SWL (hr/sem)	***125***				
Module Level	1		**Semester of Delivery**	2	
Administering Department	DEPARTMENT OF ELECTRICAL ENGINEERING TECHNIQUES		**College**	**Northern Technical University** **Engineering Technical College/Mosul**	
Module Leader	Noha Abedalbary AbedAljawad		**e-mail**	noha.m.aljwad@ntu.edu.iq	
Module Leader's Acad. Title	Lecturer		**Module Leader's Qualification**	Master	
Module Tutor	Name (if available)		**e-mail**	E-mail	
Peer Reviewer Name	Name		**e-mail**	E-mail	
Scientific Committee Approval Date	1/06/2023		**Version Number**	1.0	

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

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	1. Students will learn occupational safety in workshops and how to acts in the event of an electric shock. 2. Student will learn types of electrical conductors and methods of electrical installation. 3. Student will learn how use the contactor in some practical application. 4. Studying types of capacitors, inductances, semicondctors.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	Important: Write at least 6 Learning Outcomes, better to be equal to the number of study weeks. 1. Principles of industrial security and occupational safety within the electricity workshops. 2. Dimensional measuring devices (MICROMETER). 3. characteristics of good installations, Types of electrical installations. 4. Practical electrical installation. 5. What is the electric coils, The different types of capacitor 6. Examine the types of semiconductors. 7. Instruct the student on how to design electronic circuits.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. <u>Part A – Occupational Safety</u> Learn about safety principles in electrical shops and how to act when a shock occurs.[6hr] <u>Part B – Tools</u> Learn about tools used in workshops and how to use a micrometer to measure the diameter of conductors.[6hr] <u>Part-C- Electrical installations[18hr]</u> Methods of electrical installations and how to connect the contactors <u>Part-D-Electronics:[15hr]</u> Types of capacitors , semiconductors (Diodes, transistors), Electronic circuits.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	1- Understanding: Occupational safety, methods of installations. 2-Practical experience: Installation, micrometers, electronic circuits.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	48	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	3.2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	77	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	5.1
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**125**		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	6	10% (10)	5 and 10	LO #1, #2 and7
	Assignments	6	10% (10)	2 and 12	LO #3, #4 and #6
	Projects / Lab.	20	10% (10)	Continuous	All
	Report	8	10% (10)	2 and 12	LO #3, #4 and #6, #7
Summative assessment	**Midterm Exam**	2hr	10% (10)	8	LO #1 - #7
	Final Exam	3hr	50% (50)	15	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1:Principles of industrial security and occupational safety within the electricity workshops, general safety rules and protection against electric shock.
Week 2	Lab 2: Learn about the tools used in electrical work shops.
Week 3	Lab 3: Dimensional measuring devices (MICROMETER
Week 4	Lab 4: Electrical installations, Systems conductors insulated, How to equip the house with electric power.
Week 5	Lab 5: characteristics of good installations, Types of electrical installations, Bus-Bar
Week 6	Lab 6: Practical electrical installation(one way switch control lamp, one way switch control two lamps series, one way switch control two lamps parallel).

Week 7	Lab 7:Practical electrical installation (two ways switch control parallel lamps, two lamps parallel with reciprocating control with two way switch, Staircase lamp)
Week 8	Lab 8: : Means of controlling motors (Contactor) The idea of its work and its construction.
Week 9	Lab 9 : Using contactor to operate a three phase motor.
Week 10	Lab 10: Types of fuses used in electrical circuits, the current that each types bears..
Week 11	Lab 11: What is the electric coil, how does it work and what are its types according to the type of cores.
Week 12	Lab 12: The different types of capacitor in terms of the type of insulator used between the plates of the capacitor, the voltage that the capacitor bears, reading capacitor values using different methods.
Week 13	Lab 13: Examine the types of semiconductors (diode, transistor, etc) and knowing the unemployed ones.
Week 14	Lab 14: Instruct the student on how to design electronic circuits on printed board and install electronic components on it (simple circuit)
Week 15	Lab 15: Review.

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts		Yes
Recommended Texts		No
Websites	https://uotechnology.edu.iq/training/units/kahrabaa/kahrabaminhaj/minhaj1.html http	

Grading Scheme
مخطط الدرجات

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

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

Ministry of Higher Education and
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Northern Technical University
Engineering Technical College/Mosul
Department of Electrical Engineering Techniques

MODULE DESCRIPTOR FORM
نموذج وصف المادة الدراسية

Module Information
معلومات المادة الدراسية

Module Title	**AC ELECTRICAL CIRCUITS**	**Module Delivery**	
Module Type	CORE	✓ **Theory** **Lecture** ✓ **Lab** **Tutorial** **Practical** ✓ **Seminar**	
Module Code	EET106		
ECTS Credits	6		
SWL (hr/sem)	150		
Module Level	1	**Semester of Delivery**	2
Administering Department	**DEPARTMENT OF ELECTRICAL ENGINEERING TECHNIQUES**	**College**	**NORTHERN TECHNICAL UNIVERSITY ENGINEERING TECHNICAL COLLEGE/MOSUL**
Module Leader	Alya Hamid Ali	**e-mail**	alya.hamid@ntu.edu.iq
Module Leader's Acad. Title	Assist. Professor	**Module Leader's Qualification**	Master
Module Tutor	None	**e-mail**	None
Peer Reviewer Name	None	**e-mail**	None
Review Committee Approval	14/06/2023	**Version Number**	1.0

Relation With Other Modules
العلاقة مع المواد الدراسية الأخرى

Prerequisite module	**EET100**	**Semester**	1
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents
أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

Module Objectives أهداف المادة الدراسية	1-Understand the fundamental concepts and principles of alternating current (AC) circuits. 2-Gain knowledge of the mathematical tools and techniques used to analyze AC circuits, including phasors, complex numbers, and impedance. 3-Develop the ability to solve AC circuit problems using circuit analysis techniques such as mesh analysis, nodal analysis, and Thevenin's theorem.. ect. 4-Learn how to calculate and analyze voltage and current phasors in AC circuits, including their amplitudes, phases, and frequency relationships. 5-Explore the behavior and characteristics of AC circuit elements, such as resistors, capacitors, and inductors, and understand their roles in AC circuit analysis. 6-Investigate the concept of impedance in AC circuits and its relationship to resistance, reactance, and frequency.

	7-Study the principles of AC power and power factor, including real power, reactive power, apparent power, and power factor correction. 8- Gain a comprehensive understanding of three-phase AC systems, including the generation, transmission, and distribution of power in three-phase circuits.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1-Knowledge Acquisition: Students will acquire a comprehensive understanding of the fundamental concepts and principles of alternating current (AC) circuits. 2-Circuit Design and Analysis: Students will gain the ability to design and analyze AC circuits, applying their knowledge of impedance, power factor, and component characteristics. They will learn to calculate voltage and current magnitudes, phase differences, and power relationships in AC circuits. 3-Phasor Diagram Interpretation: Students will be able to construct and interpret phasor diagrams to visualize and analyze the behavior of voltages and currents in AC circuits. 4-Three-Phase Systems: Students will acquire understanding of three-phase AC systems, including balanced and unbalanced configurations. Laboratory Skills: Students will develop practical skills in using circuit simulation software and laboratory equipment to design, analyze, and verify the performance of AC circuits.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following: • Part A – Inductance & Capacitance in Electric circuits. General concept of capacitance (charge and voltage, capacitors in series and parallel) General concept of inductance (inductive and non-inductive circuits, capacitors in series and parallel) [4 hrs] • Part B Alternating Quantities. Ac systems, waveforms, terms and definitions. Average and R.M.S values of current and voltage. [8 hrs] • Part C Single - phase of AC Circuits. AC in resistive circuits, current and voltage in inductive circuits, current and voltage in capacitive circuits. Concept of complex impedance and admittance, AC series and parallel circuits. RL, RC and RLC circuit analysis and phasor representation. [14 hrs] • Part D Power in AC circuits. Power in resistive circuits. power in inductive and capacitive circuits ,power in circuit with resistance and reactance. Power factor, its practical importance, improvement of power factor, measurement of power in a single – phase AC circuits. [8 hrs] • Part E Three – phase circuit analysis. Basic concept and advantages of three – phase circuit. Phasor representation of star and delta connection. Phase and line quantities. Voltage and current computation in 3-phase balance and unbalance circuits. Real and Reactive power computation, measurement of power and power factor in 3-phase system. [20 hrs] • Revision problem classes [6 hrs]

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	1-Conceptual Understanding: Explain the differences between AC and DC circuits,

	introduce the concept of impedance, reactance, and phasors, and highlight the significance of frequency and phase in AC circuits. 2-Mathematical Foundations: Provide a solid mathematical foundation for AC circuits. Teach students the use of complex numbers and phasor notation to analyze AC circuits. 3-Problem-Solving Skills: Dedicate adequate time to problem-solving exercises and examples. 4-Laboratory Experiments: Incorporate laboratory experiments to reinforce theoretical concepts. Allow students to build and analyze AC circuits using oscilloscopes, function generators, and AC power sources. 5-Simulation Tools: Introduce simulation software tools that allow students to simulate AC circuits and observe their behavior. 6-Review and Assessment: Regularly review key concepts and provide formative assessments to gauge students' understanding. Offer constructive feedback on their performance to help them identify areas for improvement.

Student Workload (SWL)
الحمل الدراسي للطالب

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

Module Evaluation
تقييم المادة الدراسية

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

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
1,2,3,4,5,6	AC circuits with steady-state sinusoidal excitation: Basic concepts of frequency, angular frequency, phase shift, amplitude, peak, peak-to-peak, and root-mean-square values. Mathematical representation of sinusoidal voltages and currents, phasor representation of alternating voltages and currents, complex number representation of voltage and current phasors, the j operator and its application in circuit analysis. Complex impedance, admittance, resistance, reactance, conductance and susceptance. Solution of simple circuits by combining impedances in series and parallel.

	General circuit analysis using j notation. Resonance: Analysis and applications of series and parallel resonant circuits, bandwidth and Q factor.
7,8,9	AC power absorbed by a resistor, inductor and capacitor. Relationships between power, reactive power and VA, power factor, principle of conservation of power and reactive power, reactive power absorbed by capacitors and inductors, power factor correction, complex power in terms of phasor voltages and currents.
10,11	Poly phase and three phase system , Delta connection, Wye connection.
12,13	The power in balance phase circuit. Unbalance Wye and delta connected load, the rotating magnetic field.
14	Magnetically coupled circuits.
15	Final Examination

Delivery Plan (Weekly Lab. Syllabus)
المنهاج الاسبوعي للمختبر

	Material Covered
1	Lab.1:Operating of oscilloscope (CRO)
2	Lab.2:Utilization of oscilloscope for measuring voltage (The Sine wave)and calculate average, RMS value and time period.
3	Lab.3: Alternating voltage applied in a pure resistance circuit.
4	Lab.4: Alternating voltage applied in a pure inductive circuit.
5	Lab.5: Alternating voltage applied in a pure capacitive circuit.
6	Lab.6: Series R-L circuit
7	Lab.7: Series R-C circuit
8	Lab.8: Series R-L-c circuit
9	Lab.9: Parallel R-L circuit
10	Lab.10: Parallel R-C circuit
11	Lab.11: Parallel R-L-C circuit
12	Lab.12: Balanced 3-phase circuit star connection
13	Lab.13: Balanced 3-phase circuit delta connection.
14	Lab.14: Unbalanced 3-phase circuit star connection
15	Lab.15: review

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Charles K. Alexander, Matthew N.O. Sdiku Fundamentals of Electrical Engineering, 4th Edition, 2009	Yes
Recommended Texts	Tony R. Kuphaldt, Lessons In Electric Circuits, Volume II - AC 5th edition, 2002	No
Websites	AC circuits https://byjus.com/physics/ac-circuit/	

APPENDIX:

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

Note:

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

Ministry of Higher Education and
Scientific Research - Iraq
Northern Technical University
Engineering Technical College/Mosul
Department of Electrical Engineering Techniques

MODULE DESCRIPTOR FORM
نموذج وصف المادة الدراسية

Module Information
معلومات المادة الدراسية

Module Title	**PHYSICS**	**Module Delivery**	
Module Type	BASIC	✓ **Theory** **Lecture** ✓ **Lab** **Tutorial** **Practical** ✓ **Seminar**	
Module Code	EET107		
ECTS Credits	5		
SWL (hr/sem)	125		
Module Level	1	**Semester of Delivery**	2
Administering Department	DEPARTMENT OF ELECTRICAL ENGINEERING TECHNIQUES	**College**	NORTHERN TECHNICAL UNIVERSITY ENGINEERING TECHNICAL COLLEGE/MOSUL
Module Leader	Alya Hamid Ali	**e-mail**	alya.hamid@ntu.edu.iq
Module Leader's Acad. Title	Assist. Professor	**Module Leader's Qualification**	Master
Module Tutor	**Sanabel Muhsan**	**e-mail**	Sanabel.m.mohammed@ntu.edu.iq
Peer Reviewer Name	None	**e-mail**	None
Review Committee Approval	14/06/2023	**Version Number**	1.0

Relation With Other Modules
العلاقة مع المواد الدراسية الأخرى

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

Module Aims, Learning Outcomes and Indicative Contents
أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

Module Objectives أهداف المادة الدراسية	1- Preparing the student to study electrical and electronic physics and the properties of electrical materials and semi-conductors. 2- Understanding the basic principles and physical laws related to the work and functions
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1- Demonstrate conceptual understanding of fundamental physics principles. The study of physics promotes understanding of the basic workings of physics in human body. 2- Eexamine the types of semiconductors. 3- Analyzing the relation of frequency and wavelength 4- Analyze the effect of modulation index on refection light 5- Eexamine the energy level and energy band
Indicative Contents	Indicative content includes the following:

المحتويات الإرشادية	Irving P. Herman Physics of the Human Body/ Second Edition

Learning and Teaching Strategies
استراتيجيات التعلم والتعليم

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

Student Workload (SWL)
الحمل الدراسي للطالب

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	78	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	6.12
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	47	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	3.8
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	125		

Module Evaluation
تقييم المادة الدراسية

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

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
1	**Electrostatics generation and induction**
2	**Capacitors construction, size, capacitance of capacitor, dielectric and charge**
3	**Current Electricity, Coulomb's low**
4	**Power sources connected in parallel.**
5	**Measurement by potentiometer and Wheatstone Bridge.**
6	**Chemical Effect of Current.**

7	**Magnetic Fields and Force on Conductor**
8	**Magnetic Fields of Current-Carrying Conductors**
9	**Electromagnetic Induction.**
10	**Magnetic Properties of Materials.**
11	**A.C. Circuits. Transmission charge in**
12	**Electrons, Motion in Fields, Electron Tubes.**
13	**Junction Diode, Types, Applications and Transistors, Type, Applications, Characteristics.**
14	**Photo electricity, Energy Levels, X-Rays.**
15	**Final Examination.**

Delivery Plan (Weekly Lab. Syllabus)
المنهاج الاسبوعي للمختبر

	Material Covered
1	FORCED ON CHARGED BODIES
2	SEPARATION OF CHARGES ON OBJECTS
3	CAPACITOR TESTING
4	COULOMB'S LOW
5	PARALLEL POWER SOURCE CONNECTION
6	WHEATSTONE BRIDGE.
7	TESTING THE EFFECT CHEMICAL IN THE CURRENT
8	TESTING CURRENT IN ELECTRICAL CIRCUIT
9	MID EXAM
10	TESTING INDUCTION CURRENT
11	MEASURING AC CURRENT IN ELECTRIC CIRCUIT
12	CHARACTERISTICS DIODE
13	CHARACTERISTICS TRANSISTOR
14	REVIEW

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Charles K. Alexander, Matthew N.O. Sdiku Fundamentals of Electrical Engineering, 4th Edition, 2009	Yes
Recommended Texts	Tony R. Kuphaldt, Lessons In Electric Circuits, Volume II - AC 5th edition, 2002	No
Websites	AC circuits	

	https://byjus.com/physics/ac-circuit/

APPENDIX:

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

Note:

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Ministry of Higher Education and
Scientific Research - Iraq
Northern Technical University
Engineering Technical College/Mosul
Department of Electric Techniques Engineering

MODULE DESCRIPTOR FORM

نموذج وصف المادة الدراسية

Module Information
معلومات المادة الدراسية

Module Title	**Human Rights and Democracy**	**Module Delivery**	
Module Type	SUPLEMENT	✓ **Theory**	
Module Code	NTU100	**Lecture**	
ECTS Credits	2	**Lab**	
SWL (hr/sem)	50	**Tutorial**	
		Practical	
		✓ **Seminar**	

Module Level	1	**Semester of Delivery**	1
Administering Department	DEPARTMENT OF ELECTRI TECHNIQUES ENGINEERING	**College**	NORTHERN TECHNICAL UNIVERSITY ENGINEERING TECHNICAL COLLEGE/MOSUL
Module Leader	Dr. Bashar N Ahmed	**e-mail**	.basharnadeem@ntu.edu.iq
Module Leader's Acad. Title	Prof.	**Module Leader's Qualification**	PHD
Module Tutor	None	**e-mail**	None
Peer Reviewer Name	None	**e-mail**	None
Review Committee Approval	14/06/2023	**Version Number**	1.0

Relation With Other Modules
العلاقة مع المواد الدراسية الأخرى

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

Module Aims, Learning Outcomes and Indicative Contents
أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

Module Objectives أهداف المادة الدراسية	تهدف الديمقراطية وحقوق الانسان للحفاظ على كرامة الفرد وحقوقه الأساسية وتعزيزها كما تحقيق العدالة الاجتماعية وتشجيع التنمية الاقتصادية والاجتماعية للمجتمع وتماسكه فضلا عن توطيد الأمان الوطني وإرساء مناخ مؤات للسلام الدولي وذلك لان حقوق الانسان والديمقراطية مرجعاً أساسياً للجميع لحماية حقوق الإنسان؛ وهي توفر بيئة لحماية حقوق الإنسان وإعمالها إعمالاً فعلياً. واليوم، بعد مضي فترة على تحقيق الديمقراطية في مختلف أنحاء العالم، يبدو أن العديد من النظم الديمقراطية تتراجع. ويظهر أن بعض الحكومات تتعمد إضعاف إجراء عمليات تحقق مستقلة بشأن سلطاتها، والقضاء على أي نقد، وتفكيك الرقابة الديمقراطية وضمان حكمها لمدة طويلة، مع أثر سلبي على حقوق الشعب.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	**1** - فهم ومعرفة وأدراك حقوقه التي اقرها الله له وللبشر جميعاً وبالتالي فهي هبه وليس مكسب من أحد ولا يحق لأي شخص انتزاعها. **2**- يعبر الطالب بأسلوبه الخاص عن هذه الحقوق ويدافع عنها. **3**- تعليل الظواهر واعطاء التفسيرات لما يحدث امامه من انتهاك لحقوق الانسان وحرياته من خلال تحديد اوجه النقص او الثغرات الموجودة في ضوء المعلومات المتوفرة لديه **4**- فهم اهم النظم السياسية والتي تعد ضمانه لحقوق الانسان وحرياته السياسية ومحاولة تطبيقه على ارض الواقع الا وهو النظام الديمقراطي.

Indicative Contents المحتويات الإرشادية	❖ حقوق الانسان في التاريخ المعاصر والحديث: الاعتراف الدولي بحقوق الانسان منذ الحرب العالمية الأولى وعصبة الامم المتحدة (4 ساعات) ❖ حقوق الانسان، تعريفها، اهدافها وحقوق الانسان في الحضارات القديمة وخصوصا حضارة وادي الرافدين (6 ساعات) ضمانات واحترام وحماية حقوق الانسان على الصعيد الدولي: - دور الأمم المتحدة ووكالاتها المتخصصة في توفير الضمانات - دور المنظمات الاقليمية (الجامعة العربية، الاتحاد الأوربي، الاتحاد الافريقي، منظمة الدول الأمريكية، منظمة آسيان) ❖ دور المنظمات الدولية الاقليمية غير الحكومية والرأي العام في احترام وحماية حقوق الانسان (12 ساعة) ❖ المشاكل والمعوقات ونقاشات الطلبة (6 ساعات)

Learning and Teaching Strategies
استراتيجيات التعلم والتعليم

Strategies	-استراتيجية التفكير حسب قدرة الطالب 2-استراتيجية مهارة التفكير العالية 3-استراتيجية التفكير الناقد في التعلم 4-العصف الذهني

Student Workload (SWL)
الحمل الدراسي للطالب

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	33	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	2.2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	17	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	1.13
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	50		

Module Evaluation
تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	6	10% (10)	5, 10	LO #1, 2, and 3
	Assignments	6	10% (10)	Continuous	All
	Projects / Lab.	0	0		
	Report	7	10% (10)	5, 10	LO #1, 2, and 4
Summative assessment	**Midterm Exam**	2 hr	20% (20)	7	LO # 1-3
	Final Exam	3 hr	60% (60)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
Week 1	حقوق الانسان، تعريفها، اهدافها حقوق الانسان في الحضارات القديمة وخصوصا حضارة وادي الرافدين
Week 2	حقوق الانسان في الشرائع السماوية مع التركيز على حقوق الانسان في الإسلام

Week 3	حقوق الانسان في التاريخ المعاصر والحديث : الاعتراف الدولي بحقوق الانسان منذ الحرب العالمية الأولى وعصبة الامم المتحدة
Week 4	الاعتراف الاقليمي بحقوق الانسان : الاتفاقية الاوربية لحقوق الانسان 1950 ، الاتفاقية الامريكية لحقوق الانسان 1969 ، الميثاق الافريقي لحقوق الانسان 1981 ، الميثاق العربي لحقوق الانسان 1994
Week 5	حقوق الانسان في التاريخ المعاصر والحديث : الاعتراف الدولي بحقوق الانسان منذ الحرب العالمية الأولى وعصبة الامم المتحدة
Week 6	حقوق الانسان في الدساتير العراقية بين النظرية والواقع
Week 7	حقوق الانسان الاقتصادية والاجتماعية والثقافية و حقوق الانسان المدنية والسياسية
Week 8	حقوق الانسان الحديثة : الحقائق في التنمية ، الحق في البيئة النظيفة ، الحق في التضامن ، الحق في الدين
Week 9	ضمانات احترام وحماية حقوق الانسان على الصعيد الوطني ، الضمانات في الدستور والقوانين الضمانات في الرقابة الدستورية ، الضمانات في حرية الصحافة والرأي العام ، دور المنظمات غير الحكومية في احترام وحماية حقوق الانسان
Week 10	ضمانات واحترام وحماية حقوق الانسان على الصعيد الدولي : - دور الأمم المتحدة ووكالاتها المتخصصة في توفير الضمانات - دور المنظمات الاقليمية (الجامعة العربية ، الاتحاد الأوربي ، الاتحاد الافريقي ، منظمة الدول الأمريكية ، منظمة آسيان) دور المنظمات الدولية الاقليمية غير الحكومية والرأي العام في احترام وحماية حقوق الانسان
Week 11	مصطلح الديمقراطية ، نشأته، دلالته، تاريخ الديمقراطية.
Week 12	الاسلام والديمقراطية ومساوئ الحكم الاستبدادي .
Week 13	الانتقادات الموجهة للديمقراطية، ومحاسن النظام الديمقراطي.
Week 14	الأنظمة الديمقراطية في العالم/الديمقراطية في العالم الثالث/ المشاكل التي تواجه البلدان العربية في التحول الديمقراطي
Week 15	**الامتحان النهائي**

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	حقوق الانسان والديمقراطية – المفاهيم والمرتكزات للدكتور سماح مهدي العلياوي والدكتور سلمان كاظم البهادلي	Yes
Recommended Texts	الديمقراطية وحقوق الانسان في الاسلام للدكتور راشد الغنوشي	No
Websites	https://www.neelwafurat.com https://studies.aljazeera.ne	

APPENDIX:

GRADING SCHEME مخطط الدرجات				
Group	**Grade**	التقدير	**Marks (%)**	**Definition**
Success Group (50 - 100)	**A** – Excellent	امتياز	90 - 100	Outstanding Performance
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Ministry of Higher Education and
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Engineering Technical College/Mosul
Department of Electrical Engineering Techniques

MODULE DESCRIPTOR FORM

نموذج وصف المادة الدراسية

Module Information

معلومات المادة الدراسية

Module Title	**ENGLISH LANGUAGE**	**Module Delivery**	
Module Type	SUPLEMENT	✓ **Theory** ✓ **Lecture** **Lab** **Tutorial** **Practical** **Seminar**	
Module Code	**NTU101**		
ECTS Credits	4		
SWL (hr/sem)	**100**		
Module Level	1	**Semester of Delivery**	1
Administering Department	**DEPARTMENT OF ELECTRICAL ENGINEERING TECHNIQUES**	**College**	**NORTHERN TECHNICAL UNIVERSITY ENGINEERING TECHNICAL COLLEGE/MOSUL**
Module Leader	Dr. Ahmed Abdul-Jalil Abdullah	**e-mail**	ahmedalkarakchi@ntu.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	14/06/2023	**Version Number**	1.0

Relation With Other Modules

العلاقة مع المواد الدراسية الأخرى

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

Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

Module Objectives أهداف المادة الدراسية	Unit one: Introduce yourself and others using am/are/is and my/your. Practice saying hello and goodbye in different situations. Unit two: Talk about your hobbies, interests and activities using he/she/they and his/her. Practice asking and answering questions. Unit three: Describe yourself and others using adjectives and nouns. Practice giving personal information. Unit four: Talk about your family and friends using possessive adjectives, possessive 's and has/have. Practice describing relationships and appearance. Unit five: Talk about your daily routine and habits using present simple with I/you/we/they, a and an. Practice telling the time and date. Unit six: Talk about your work or school life using present simple with he/she, questions, negatives and adverbs of frequency. Practice expressing likes and dislikes. Unit seven: Talk about your favorite things using question words, pronouns and this/that. Practice making comparisons and preferences. Unit eight: Talk about your home and neighborhood using there is/are and prepositions of place. Practice describing location and giving directions. Unit nine: Talk about your past experiences using was/were born and past simple with irregular verbs. Practice telling stories and biographies. Unit ten: Talk about your recent holidays or events using past simple with

	regular and irregular verbs, questions, negatives and ago. Practice narrating events in chronological order. Unit eleven: Talk about your abilities and skills using can/can't and adverbs. Practice making requests and offers. Unit twelve: Talk about your shopping habits and needs using some/any, like/would like and thank you. Practice ordering food and buying things.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	Unit one: Student will be able to introduce himself and others in a polite and friendly way using basic grammar and vocabulary. Unit two: Student will be able to talk about his hobbies, interests and activities in simple sentences using subject pronouns and possessive adjectives. Unit three: Student will be able to describe himself and others using adjectives and nouns in positive and negative sentences. Unit four: Student will be able to talk about his family and friends using possessive adjectives, possessive 's and has/have in statements and questions. Unit five: Student will be able to talk about his daily routine and habits using present simple with I/you/we/they, a and an in affirmative and negative sentences. Unit six: Student will be able to talk about his work or university life using present simple with he/she, questions, negatives and adverbs of frequency in different contexts. Unit seven: Students will be able to talk about their favorite things using question words, pronouns and this/that in short answers and comparisons. Unit eight: Students will be able to talk about their home and neighborhood using there is/are and prepositions of place in descriptions and directions. Unit nine: Student will be able to talk about his past experiences using was/were born and past simple with irregular verbs in statements and questions. Unit ten: Student will be able to talk about his recent holidays or events using past simple with regular and irregular verbs, questions, negatives and ago in narratives and sequences. Unit eleven: Student will be able to talk about his abilities and skills using can/can't and adverbs in statements and questions. Student will also be able to make requests and offers using can/can't. Unit twelve: Students will be able to talk about their shopping habits and needs using some/any, like/would like and thank you in statements and questions. Student will also be able to order food and buy things using polite language.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following: • Part A – General meeting and introduction. This section provides an overview of Hello, Am/Are/Is, My/Your, This is with Practice in Work, Your World, He/She/They, His/Her, Questions. [6 hrs] • Part B Every day. Vocabulary related to different topics. Possessive adjectives, Possessive's, Has/have, Adjective+ noun. Present simple I/you/we/they, A and an [10 hrs] • Part C Time and event. Present simple, Questions and negatives, Adverbs of frequency. Question words, Pronouns, This and that. There is/are…, Prepositions [8 hrs] • Revision problem classes [4 hrs]

Learning and Teaching Strategies
استراتيجيات التعلم والتعليم

Strategies	**Building relationships and appreciating their culture:** Teachers should take the time to learn about their students' cultures and backgrounds. **Using actions and gestures to show what to do:** Teachers can use nonverbal cues such as pointing, gesturing, and facial expressions to help students understand what they are trying to communicate. **Planning lessons and using language objectives:** Teachers should plan lessons that are appropriate for their students' language proficiency levels. **Provide opportunities for students to work in pairs or small groups:** Working in pairs or small groups can help students who are learning English as a new language practice their speaking skills in a less intimidating environment. **Use visuals such as pictures, diagrams, and graphic organizers:** Visuals can help students who are learning English as a new language understand complex concepts more easily.

	Provide opportunities for students to use technology: Technology can be used to support English-language learners by providing access to online resources such as videos, podcasts, and interactive activities. **Encourage students to read widely:** Reading widely can help students who are learning English as a new language improve their vocabulary and comprehension skills 2.

Student Workload (SWL)
الحمل الدراسي للطالب

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	33	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	2.2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	67	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	4.46
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	100		

Module Evaluation
تقييم المادة الدراسية

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

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
1	Unit one: hello, Am/are/is, my/your, This is with practice in work.
2	Unit two: your world, He/she /they, his/her, Questions.
3	Unit three: all about.
4	Unit four: family and friends, Possessive adjectives, Possessive's, Has/have, Adjective+ noun.
5	Unit Five: the way I live, Present simple l/you /we /they, A and an.
6	Unit six: every day, Present simple he/she, Questions and negatives, Adverbs of frequency.
7	Unit seven: my favorites, Question words, Pronouns, This and that
8	Unit eight: where I live, There is /are..., Prepositions
9	Unit nine: times past, Was /were born, Past simple -irregular verbs.
10	Unit ten: we had a great time!, Past simple regular & irregular, Question, Negatives and Ago.
11	Unit eleven: Can /can't, Adverbs, Requests, I can do that.
12	Unit twelve: please I'd like..., Some and any, Like and would like and thank you.
13	Unit thirteen: here and now, Present continuous, Present simple & present continuous.
14	Unit fourteen: it's time to go!, Future plans, Revision writing email and informant letter.
15	Final Examination

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	New Headway Beginner Fourth Edition	Yes
Recommended Texts	New Headway Beginner Workbook	Online

Websites	https://elt.oup.com/student/headway/beg/?cc=global&selLanguage=en

APPENDIX:

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

Note:

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

Ministry of Higher Education and
Scientific Research - Iraq
Northern Technical University
Engineering Technical College/Mosul
Department of Electric Techniques Engineering

MODULE DESCRIPTOR FORM

نموذج وصف المادة الدراسية

Module Information
معلومات المادة الدراسية

Module Title	**Arabic Language**	**Module Delivery**	
Module Type	SUPLEMENT	✓ **Theory** **Lecture** **Lab** **Tutorial** **Practical** ✓ **Seminar**	
Module Code	NTU102		
ECTS Credits	3		
SWL (hr/sem)	75		
Module Level	1	**Semester of Delivery**	2
Administering Department	DEPARTMENT OF COMPUTER TECHNIQUES ENGINEERING	**College**	NORTHERN TECHNICAL UNIVERSITY ENGINEERING TECHNICAL COLLEGE/MOSUL
Module Leader	**Dr. Bashar N. Ahmed**	**e-mail**	basharnadeem@ntu.edu.iq
Module Leader's Acad. Title	Prof.	**Module Leader's Qualification**	PHD
Module Tutor	None	**e-mail**	None
Peer Reviewer Name	None	**e-mail**	None
Review Committee Approval	14/06/2023	**Version Number**	1.0

Relation With Other Modules
العلاقة مع المواد الدراسية الأخرى

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

Module Aims, Learning Outcomes and Indicative Contents
أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

Module Objectives أهداف المادة الدراسية	ينشأ الطالب على حب اللّغة العربيّة لغة القرآن الكريم. التعرّف على مواطن الجمال في اللّغة العربيّة وآدابها، وأن يكتسب الطالب القدرة على دراسة فروع اللّغة العربيّة. تعريف الطالب بألفاظ اللّغة العربيّة الصحيحة وتراكيبها وأساليبها السليمة بطريقة مشوقة وجذابة. أن يستغل الطالب وقت فراغه بالقراءة والاطلاع والرجوع إلى المكتبة . تمكين الطالب من القراءة الصحيحة، وأن يكتسب القدرة على استعمال اللغة استعمالاً صحيحاً في الاتّصال مع الآخرين؛ كالسرعة وجودة الإلقاء وحسن التعبير، وتعويده حسن الاستماع لما يسمع مما ييسّر له أموره ويعينه على قضاء حوائجه. تنمية الذوق الأدبي لدى الطالب حتى يدرك النواحي الجمالية في أساليب الكلام ومعانيه وصوره. تعويد الطالب التعبيرات السليمة الواضحة عن أفكاره وما يقع تحت حواسه نطقاً وكتابة وحسن استخدام علامات الترقيم. تنمية قدرة ومهارة الطالب الإملائية والخطية بحيث يستطيع الكتابة الصحيحة من جميع النواحي. إيقاظ وعي الطالب لإدراك شرف الكلمة وتوجيهه؛ للمحافظة على طهارتها ونقائها حتى لا تستعمل إلا في الخير. مساعدة الطالب على فهم التراكيب المعقدة والأساليب الغامضة .
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. معرفة القواعد النحوية والصرفية. 2- التعريف بأبرز المصنفات اللغوية والأدبية. 3- تحديد المشكلات اللغوية والأدبية لدى الدارسين. 4- القراءة المعاصرة للنصوص اللغوية والأدبية. 5- قراءة النصوص الأدبية وكتابتها وفق المعايير النحوية والصرفية 6- تعزيز الثقة بالنفس والجرأة والفصاحة 7- المنافسة والتميز في سوق العمل.

Indicative Contents المحتويات الإرشادية	❖ مقدمة عن الأخطاء اللغوية التاء المربوطة والتاء المفتوحة (4 ساعات) ❖ تطبيقات الأخطاء اللغوية الشائعة واقسام الكلام (6 ساعات) ❖ همزة الوصل والقطع والهمزة المتوسطة والمتطرفة قواعد كتابة الالف الممدودة والمقصورة الحروف الشمسية والقمرية والضاد والظاء (12 ساعة) ❖ المشاكل والمعوقات ونقاشات (6 ساعات)

Learning and Teaching Strategies
استراتيجيات التعلم والتعليم

Strategies	1- .تبسيط المعلومات وتنظيمها 2- .تسهيل عملية استرجاع المعلومات 3- ربط المفاهيم الجديدة بالمكتسبات السابقة 4- .إيجاد العلاقة بين المفاهيم 5 - تسهيل تذكر المعارف والمعلومات

Student Workload (SWL)
الحمل الدراسي للطالب

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	33	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	2.2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	42	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	2.8
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	75		

Module Evaluation
تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	6	10% (10)	5, 10	LO #1, 2, 10 and 11
	Assignments	3	10% (10)	Continuous	All
	Projects / Lab.	0	10% (10)		
	Report	5	10% (10)		LO,#6 ,#7 and #9
Summative assessment	**Midterm Exam**	2 hr	20% (20)	7	LO # 1-7
	Final Exam	3 hr	60% (60)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
Week 1	مقدمة عن الأخطاء اللغوية
Week 2	التاء المربوطة والتاء المفتوحة
Week 3	همزة الوصل والقطع
Week 4	الهمزة المتوسطة والمتطرفة
Week 5	قواعد كتابة الالف الممدودة والمقصورة
Week 6	الحروف الشمسية والقمرية

Week 7	الضاد والظاء
Week 8	العـــدد
Week 9	المفاعيل
Week 10	أقسام الكلام
Week 11	معاني حروف الجر
Week 12	تطبيقات الأخطاء اللغوية الشائعة
Week 13	النون والتنوين
Week 14	مقدمة عن الأخطاء اللغوية
Week 15	الامتحان النهائي

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	الكامل في اللغة والادب لابي عباس المبرد	Yes
Recommended Texts	أخطاء لغوية شائعة لخالد بن هلال بن ناصر العبري	No
Websites	https://www.eshamel.ne https://www.ektebsa7.com	

APPENDIX:

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

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

Ministry of Higher Education and
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Department of Electrical Engineering Techniques

MODULE DESCRIPTOR FORM

نموذج وصف المادة الدراسية

Module Information

معلومات المادة الدراسية

Module Title	**COMPUTER PRINCIPLE**	**Module Delivery**	
Module Type	BASIC	✓ **Theory** **Lecture** ✓ **Lab** **Tutorial** ✓ **Practical** ✓ **Seminar**	
Module Code	NTU103		
ECTS Credits	5		
SWL (hr/sem)	125		
Module Level	1	**Semester of Delivery**	2
Administering Department	**DEPARTMENT OF ELECTRICAL ENGINEERING TECHNIQUES**	**College**	**NORTHERN TECHNICAL UNIVERSITY ENGINEERING TECHNICAL COLLEGE/MOSUL**
Module Leader	Salar Jamal Rashid	**e-mail**	salar.jamal@ntu.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	14/06/2023	**Version Number**	1.0

Relation With Other Modules

العلاقة مع المواد الدراسية الأخرى

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

Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

Module Objectives أهداف المادة الدراسية	1-Understanding the Fundamentals: The primary objective of a computer principal course is to provide students with a solid foundation in the fundamental principles of computer work. This includes concepts such as Hardware, Software and new technologies in computer area. 2-Analyzing the work of Components: Students will learn how does computer parts work and the parts of each of them. They will understand their behavior in normal condtion and be able to calculate their effects on the overall performance of work. 3-Computer Specifications: Students will become familiar with important properties of each computer components and be able to install the proper hardware/software for their computer. 4-Laboratory Skills: The course includes hands-on laboratory experiments to provide students with practical experience of using Microsoft Office progmars suck as Word, PowerPoint, Excel and Access.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1-Fundamental Knowledge: Students will acquire a solid understanding of the fundamental concepts and principles of computer hardware components, including CPU, RAM, Storage Devices, Input and output devices. 2-Copmputer performance Skills: Students will be able to buy their own PC/Laptop in a manner that allow to use the full capability of the computer with less price.

	3-Computer Software Skill: Students will be able to install computer drivers and the essential programs. 4-Through hands-on laboratory experiments, students will be able to write reports, homework and posters by using Word program, on the other hand they will be able to prepare presentations using PowerPoints program. Also, they will be able to use Excel and Access programs to solve equations and draw curves.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following: • Part A – Introduction to Computer. Constituent the field of using computer, types of computers and their differences, The advantages and disadvantages of computers [8 hrs] • Part B Computer Components. CPU, RAM, Storage Devices, Input and Output devices [14 hrs] • Part C Office programs . Microsoft Word, Microsoft PowerPoint, Microsoft Excel and Microsoft Access. [32 hrs] • Revision problem classes [6 hrs]

Learning and Teaching Strategies
استراتيجيات التعلم والتعليم

Strategies	1-**Hands-on Experiments:** Engage students in practical experiments to deepen their understanding of circuits. 2-**Videos:** seeing videos for best understanding of components work. 3-**Group Reports:** Assign collaborative reports for new computer technology. 4-**Interactive Discussions:** Encourage student participation and critical thinking through open-ended questions. 5-**Assessment Variety:** Use diverse assessment methods to gauge student understanding. 6-**Office Hours and Support:** Offer individualized assistance through office hours or online support.

Student Workload (SWL)
الحمل الدراسي للطالب

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

Module Evaluation
تقييم المادة الدراسية

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

Delivery Plan (Weekly Lab. Syllabus)

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
1	Introduction to computer
2	Hardware and Software
3	Central Processing Unit
4	Memory
5	Storage Devices
6	Motherboard
7	Operating System
8	Windows Desktop
9	Installing and removing programs
10	Utility programs
11	Internet
12	Cloud services
13	Artificial Intelligence Websites and Programs
11	Artificial Intelligence Websites and Programs (Contd.)
12	Virtual Reality
13	Augmented Reality
14	Smart Websites
15	Final Examination

المنهاج الاسبوعي للمختبر

	Material Covered
1	LAB 1: INTRODUCTION TO MICROSOFT OFFICE PROGRAM
2	LAB 2: FILE AND HOME TABS IN MICROSOFT WORD
3	LAB 3: INSERT TAB IN MICROSOFT WORD
4	LAB 4: DESING AND LAYOUT TABS IN MICROSOFT WORD
5	LAB 5: HOME AND INSERT TAB IN MICROSOFT POWERPOINT
6	LAB 6: TRANSITIONS TAB IN MICROSOFT POWERPOINT
7	LAB 7: ANIMATIONS TAB IN MICROSOFT POWERPOINT
8	LAB 8: HOME TAB IN MICROSOFT EXCEL
9	LAB 9: INSERT TAB IN MICROSOFT EXCEL
10	LAB 10: WRITING FORMULAS IN MICROSOFT EXCEL
11	LAB 11: CREATING TABLES IN MICROSOFT ACCESS
12	LAB 12: CREATING FORMS IN MICROSOFT ACCESS
13	LAB 13: CREATING REPORTS IN MICROSOFT ACCESS
14	LAB 14: REVIEW

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Fundamentals of Computer Work	Yes
Recommended Texts	Fundamentals of Computer Work	No
Websites	Youtube	

APPENDIX:

GRADING SCHEME مخطط الدرجات				
Group	**Grade**	التقدير	**Marks (%)**	**Definition**
Success Group (50 - 100)	**A** - Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
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	F – Fail	راسب	(0-44)	Considerable amount of work required
Note:				

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

Ministry of Higher Education and
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Department of Electrical Engineering Techniques

MODULE DESCRIPTOR FORM

نموذج وصف المادة الدراسية

Module Information

معلومات المادة الدراسية

Module Title	**PRINCIPLES POWER ENGINEERING**	**Module Delivery**	
Module Type	CORE	✓ **Theory** **Lecture** ✓ **Lab** **Tutorial** ✓ **Practical** ✓ **Seminar**	
Module Code	EET300		
ECTS Credits	5		
SWL (hr/sem)	150		
Module Level	3	**Semester of Delivery**	1
Administering Department	**DEPARTMENT OF ELECTRICAL ENGINEERING TECHNIQUES**	**College**	**NORTHERN TECHNICAL UNIVERSITY ENGINEERING TECHNICAL COLLEGE/MOSUL**
Module Leader	Mohammed Yahya	**e-mail**	mohammed.yahya@ntu.edu.iq
Module Leader's Acad. Title	Professor	**Module Leader's Qualification**	PhD
Module Tutor	None	**e-mail**	None
Peer Reviewer Name	None	**e-mail**	None
Review Committee Approval	14/06/2023	**Version Number**	1.0

Relation With Other Modules

العلاقة مع المواد الدراسية الأخرى

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

Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

Module Objectives
أهداف المادة الدراسية

The aim of the module on Basic Electrical Power Engineering is to provide students with a foundational understanding of the principles, concepts, and applications related to electrical power systems. The module aims to introduce students to the fundamental knowledge and skills necessary for further study and specialization in electrical power engineering.

Learning Outcomes:

1- Demonstrate a basic understanding of electrical power systems, their components, and their operation.
2- Apply fundamental mathematical and analytical techniques to solve basic problems in power systems.
3- Recognize and explain the different types of power generation, transmission, and distribution technologies.
4- Identify basic safety considerations and regulations in electrical power engineering.
5- Demonstrate effective communication of basic electrical power engineering concepts, both orally and in written form.

Indicative Contents:

	Introduction to Electrical Power Systems: Overview of electrical power systems and their components. Basic concepts and definitions in electrical power engineering. Circuit Analysis Techniques: Introduction to different types of power generation, such as thermal, hydro, and renewable. Overview of power plants and their operation. Power Transmission and Distribution: Introduction to transmission and distribution systems. Overview of transformers, transmission lines, and distribution networks. Safety and Regulations
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1- Demonstrate a basic understanding of electrical power systems, including their components, operation, and key principles. 2- Apply fundamental mathematical and analytical techniques to solve basic problems in electrical circuits and power systems. 3- Recognize and explain the various types of power generation, transmission, and distribution technologies used in electrical power systems. 4- Understand and adhere to basic safety considerations and regulations in electrical power engineering.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following: • Part A – General Electric power System. Constituent parts of an electrical power system: Basic structure of power system, Comparison of Conductor Materials in overhead systems, [20 hrs] • Part B Overhead line insulator. Overhead line insulator structure, martials, characteristics of insulators, stress in insulators, string efficiency, string efficiency modified, corona losses, voltage disruptive [12 hrs] • Part C Transmission Constants Transmission Constants: Line inductance, single phase three phase and double circuit, Line capacitance, single, three phase, double circuit and effect of earth and substations [24 hrs] • Revision problem classes [6 hrs]

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	1-**Hands-on Experiments:** Engage students in practical experiments to deepen their understanding of circuits. 2-**Simulation Software:** Use circuit simulation software for virtual circuit design and analysis. 3-**Problem-solving Exercises:** Include various problem-solving exercises to apply circuit analysis techniques. 4-**Group Projects:** Assign collaborative projects for circuit design and construction. 5-**Real-world Applications:** Discuss practical applications of circuits in different devices and systems.

	5-**Interactive Discussions:** Encourage student participation and critical thinking through open-ended questions. 6-**Conceptual Understanding:** Focus on intuitive understanding alongside mathematical analysis. 7-**Assessment Variety:** Use diverse assessment methods to gauge student understanding. 8-**Office Hours and Support:** Offer individualized assistance through office hours or online support.

Student Workload (SWL)
الحمل الدراسي للطالب

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

Module Evaluation
تقييم المادة الدراسية

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

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
1	Basic structure of power system
2,3	Comparison of Conductor Materials in overhead systems
4,5	Mechanical and Electrical design of overhead Transmission system
6,7	Overhead line insulator
8	Corona
9,10,11	Transmission Constants: Line inductance, single phase three phase and double circuit
12,13	Line capacitance, single, three phase, double circuit and effect of earth
14	Substations
15	Final Examination

Delivery Plan (Weekly Lab. Syllabus)
المنهاج الاسبوعي للمختبر

	Material Covered
1	introduction to the lab. equipment’s
2	load curve and load factor
3	voltage drop in the distribution lines
4	loading the distribution transformer by star connected resistive load (balance and unbalance)

5	loading the distribution transformer by star connected inductive load (balance and unbalance)
6	loading the distribution transformer by delta connected resistive load (balance and unbalance)
7	loading the distribution transformer by delta connected inductive load (balance and unbalance)
8	power factor improvement
9	introduction to underground cables
10	transmission line model
11	transmission line model test
12	transmission line model loading resistive load
13	transmission line model loading inductive load
14	review

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	P. V. Gupta, M. L. Soni, A course in Electrical Power	Yes
Recommended Texts	P. V. Gupta, Transmission and Distribution	No
Websites	Electrical power engineering	

APPENDIX:

GRADING SCHEME
مخطط الدرجات

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

Note:

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

Ministry of Higher Education and
Scientific Research - Iraq
Northern Technical University
Engineering Technical College/Mosul
Department of Electrical Engineering Techniques

MODULE DESCRIPTOR FORM
نموذج وصف المادة الدراسية

Module Information
معلومات المادة الدراسية

Module Title	**DC POWER CONVERTER**	**Module Delivery**	
Module Type	CORE	✓ **Theory** **Lecture** ✓ **Lab** **Tutorial** ✓ **Practical** ✓ **Seminar**	
Module Code	**EET301**		
ECTS Credits	5		
SWL (hr/sem)	125		
Module Level	3	**Semester of Delivery**	1
Administering Department	**DEPARTMENT OF ELECTRICAL ENGINEERING TECHNIQUES**	**College**	**NORTHERN TECHNICAL UNIVERSITY ENGINEERING TECHNICAL COLLEGE/MOSUL**
Module Leader	Rakan Khalil ANTAR	**e-mail**	Rakan.antar@ntu.edu.iq
Module Leader's Acad. Title	Asst. Prof	**Module Leader's Qualification**	PhD
Module Tutor	None	**e-mail**	None
Peer Reviewer Name	None	**e-mail**	None
Review Committee Approval	13/06/2023	**Version Number**	1.0

Relation With Other Modules
العلاقة مع المواد الدراسية الأخرى

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

Module Aims, Learning Outcomes and Indicative Contents
أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

Module Objectives
أهداف المادة الدراسية

Students will learn the principle of ;

1. Understand the fundamental principles and concepts involved in DC power conversion, including voltage and current regulation, power transfer efficiency, and control techniques.
2. Identify and analyze different DC power converter topologies, such as buck converters, boost converters, buck-boost converters, and flyback converters, understanding their working principles, advantages, and limitations.

	3. Design and analyze DC power converters for specific applications, considering parameters such as voltage and current requirements, efficiency, and size constraints. Select appropriate components and determine control strategies for achieving desired performance specifications. 4. Develop proficiency in modeling and simulation techniques for DC power converters, using software tools or programming languages to analyze converter behavior under different operating conditions and evaluate performance metrics. 5. Understand various control techniques used in DC power converters, such as pulse width modulation (PWM), voltage mode control, current mode control, and hysteresis control. Analyze the stability and dynamic response of control loops. 6. Familiarize with passive and active components used in DC power converters, including inductors, capacitors, diodes, MOSFETs, and IGBTs. Understand their characteristics, selection criteria, and their impact on converter performance and reliability. 7. Gain awareness of practical considerations and challenges associated with DC power converter implementation, such as thermal management, electromagnetic interference (EMI), component stress, and protection mechanisms. Learn techniques to mitigate these issues. 8. Evaluate the efficiency and power quality aspects of DC power converters, including efficiency calculations, harmonic content analysis, power factor correction, and techniques to reduce switching losses. 9. Understand the integration of DC power converters in larger systems, such as renewable energy systems, electric vehicles, and power electronic interfaces. Gain awareness of the interaction between converters and other system components. 10. Develop troubleshooting and problem-solving skills to diagnose and rectify issues related to DC power converters. Analyze and interpret experimental data, identify sources of errors or failures, and propose solutions. By achieving these module objectives, students will gain a comprehensive understanding of DC power converters, enabling them to design, analyze, and implement efficient and reliable power conversion systems in various applications.
	1. Understanding of DC Power Conversion Principles: Students should be able to comprehend the fundamental principles and concepts involved in DC power conversion, including voltage and current regulation, power transfer efficiency, and control techniques. 2. Knowledge of DC Power Converter Topologies: Students should be familiar with various DC power converter topologies, such as buck converters, boost converters, buck-boost converters, and flyback converters. They should

Module Learning Outcomes مخرجات التعلم للمادة الدراسية	understand the working principles, advantages, and limitations of each topology. 3. Ability to Design and Analyze DC Power Converters: Students should be capable of designing and analyzing DC power converters for specific applications. They should be able to calculate component values, select appropriate switching devices, and determine the required control strategies for achieving desired performance specifications. 4. Proficiency in Modeling and Simulation: Students should be proficient in using software tools or programming languages to model and simulate the behavior of DC power converters. They should be able to analyze converter performance under different operating conditions, evaluate transient responses, and assess the impact of parameter variations. 5. Understanding of Control Techniques: Students should have a solid understanding of different control techniques employed in DC power converters, such as pulse width modulation (PWM), voltage mode control, current mode control, and hysteresis control. They should be able to analyze the stability and dynamic response of the control loops. 6. Knowledge of Passive and Active Components: Students should be familiar with the characteristics and selection criteria of passive components (e.g., inductors, capacitors) and active components (e.g., diodes, MOSFETs, IGBTs) used in DC power converters. They should understand their impact on converter performance and reliability. 7. Awareness of Practical Considerations: Students should be aware of practical considerations and challenges associated with DC power converter implementation, such as thermal management, electromagnetic interference (EMI), component stress, and protection mechanisms. They should understand techniques to mitigate these issues. 8. Ability to Evaluate Efficiency and Power Quality: Students should be able to assess the efficiency and power quality aspects of DC power converters, including efficiency calculations, harmonic content analysis, power factor correction, and mitigation of switching losses. 9. Integration of DC Power Converters in Systems: Students should understand the integration of DC power converters in larger systems, such as renewable energy systems, electric vehicles, and power electronic interfaces. They should be aware of the interaction between converters and other system components. 10. Troubleshooting and Problem-Solving Skills: Students should develop troubleshooting and problem-solving skills to diagnose and rectify issues related to DC power converters. They should be able to analyze and interpret experimental data, identify sources of errors or failures, and propose solutions.

	These learning outcomes provide a comprehensive understanding of DC power converters, enabling students to design, analyze, and implement efficient and reliable power conversion systems.
Indicative Contents المحتويات الإرشادية	1. Introduction to Power Electronics Basic concepts and applications of power electronics Overview of DC power converters and their significance 2. DC Power Converter Topologies Buck converter: operation, analysis, and control Boost converter: operation, analysis, and control Buck-boost converter: operation, analysis, and control Flyback converter: operation, analysis, and control Other DC-DC converter topologies (e.g., Cuk, SEPIC) 3. Power Semiconductor Devices Characteristics and selection criteria of diodes, MOSFETs, IGBTs, and other power devices Switching characteristics and losses of power devices Thermal considerations and heat sinks 4. Passive Components and Magnetics Characteristics and selection criteria of inductors and capacitors Design and modeling of magnetic components (e.g., transformers, inductors) Core materials and magnetic losses 5. Control Techniques for DC Power Converters Pulse width modulation (PWM) techniques and their implementation Voltage mode control and current mode control Hysteresis control and sliding mode control Stability analysis and design considerations 6. Modeling and Simulation of DC Power Converters Mathematical modeling of DC power converters Simulation tools and software (e.g., MATLAB/Simulink, PSpice) Transient and steady-state analysis Parameter variation and sensitivity analysis Control Loop Design and Stability Compensation techniques for control loops Bode plots and frequency response analysis Stability criteria (e.g., Nyquist criterion, root locus analysis) Design of feedback and feedforward control loops 7. Power Quality and Efficiency Considerations Efficiency calculations and optimization techniques Harmonic content analysis and mitigation techniques Power factor correction (PFC) techniques Mitigation of switching losses and EMI

	8. Practical Considerations and Implementation Thermal management and heat sinks Component stress and reliability considerations Protection mechanisms (e.g., overcurrent, overvoltage, short-circuit) Snubber circuits and soft-switching techniques 9. Applications of DC Power Converters Renewable energy systems (e.g., solar, wind) Electric vehicle power electronics Power electronic interfaces (e.g., AC-DC converters, DC-AC inverters) Industrial power supplies and consumer electronics 10. Case Studies and Practical Projects Analysis and design of specific DC power converter applications Hardware implementation and experimental validation Troubleshooting and problem-solving exercises These indicative contents cover the key topics and concepts typically included in a DC power converter course. They provide a foundation for understanding, analyzing, and designing various DC power [16 hrs]

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	1. Lectures: Traditional lectures can be used to introduce the theoretical concepts and principles of DC power converters. Instructors can present the material using visual aids, such as slides or whiteboards, and explain the underlying theory, operating principles, and design considerations. 2. Hands-on Laboratory Sessions: Practical laboratory sessions are essential for students to gain hands-on experience with DC power converters. These sessions can involve building and testing actual converters, measuring performance parameters, and troubleshooting. Students can also use simulation software or hardware-in-the-loop setups to simulate and analyze converter behavior. 3. Design Projects: Assigning design projects related to DC power converters allows students to apply their knowledge and skills to real-world scenarios. They can be given specific requirements and constraints to design, simulate, and build a power converter for a given application. This promotes problem-solving skills, critical thinking, and practical application of concepts. 4. Case Studies and Examples: Presenting case studies and practical examples of DC power converter applications can help students understand the relevance and significance of the concepts learned. Analyzing and discussing real-world implementations, challenges faced, and solutions adopted can enhance their problem-solving abilities and broaden their perspective.

5. Group Discussions and Peer Learning: Encouraging group discussions and peer learning activities allows students to exchange ideas, discuss concepts, and learn from each other's experiences. This can be done through group projects, problem-solving sessions, or collaborative analysis of research papers and industry reports related to DC power converters.
6. Online Resources and Simulations: Utilizing online resources, such as video tutorials, interactive simulations, and online modules, can enhance learning accessibility and provide additional reinforcement of concepts. Virtual simulations and interactive tools can help students visualize and manipulate DC power converter circuits, observe their behavior, and gain practical insights.
7. Guest Lectures and Industry Collaboration: Inviting guest lecturers from industry or research organizations can expose students to real-world applications, emerging trends, and practical challenges in the field of DC power converters. Industry collaborations can provide opportunities for internships, projects, and exposure to the latest advancements and technologies.
8. Assessments and Feedback: Regular assessments, such as quizzes, exams, and assignments, can evaluate students' understanding of the concepts and their ability to apply them. Constructive feedback should be provided to help students identify areas of improvement and reinforce their learning.
9. Self-Study and Research: Encouraging self-study and research allows students to explore specific topics of interest related to DC power converters. They can delve deeper into advanced concepts, explore recent research papers, and broaden their knowledge base beyond the curriculum.
10. Continuous Learning and Professional Development: Promoting continuous learning and professional development opportunities, such as workshops, seminars, and industry conferences, can help students stay updated with the latest developments and trends in DC power converters. It encourages lifelong learning and prepares them for future challenges and advancements in the field.

By combining a variety of teaching strategies, educators can create an engaging and comprehensive learning experience for students studying DC power converters. It allows them to develop a strong theoretical foundation, practical skills, problem-solving abilities, and critical thinking skills necessary for success in this field.

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

Module Evaluation
تقييم المادة الدراسية

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

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
	Week 1: • Introduction to DC power conversion principles • Types and applications of DC power converters • Overview of converter topologies Week 2: * DC-DC Buck Converters: • Operating principle and steady-state analysis • Control techniques: voltage mode and current mode control • Design considerations and component selection Week 3: * DC-DC Boost Converters:

- Operating principle and steady-state analysis
- Control techniques: voltage mode and current mode control
- Design considerations and component selection

Week 4 and 5:

* Buck-Boost Converters:

- Operating principle and steady-state analysis
- Control techniques: voltage mode and current mode control
- Design considerations and component selection

Week 6:

* Flyback Converters:

- Operating principle and steady-state analysis
- Control techniques: voltage mode and current mode control
- Design considerations and component selection

Week 7, 8, and 9:

* Other DC Power Converter Topologies:

- Cuk converters
- SEPIC converters
- Zeta converters
- Full-bridge converters
- Half-bridge converters

Week 10 and 11:

* Control Techniques for DC Power Converters:

- Pulse width modulation (PWM)
- Voltage mode control
- Current mode control
- Hysteresis control
- Feedback and compensation techniques

Week 12 and 13:

* Modeling and Simulation of DC Power Converters:

- Small-signal modeling and transfer functions

	• Large-signal and time-domain simulation • Transient response analysis Week 14: * Efficiency and Power Quality Analysis: • Efficiency calculations and optimization techniques • Harmonic content analysis and mitigation strategies • Power factor correction techniques • Switching losses and soft-switching techniques Week 15: * Final Exam:

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: • Lab Safety and Introduction to Lab Equipment • Familiarization with Power Supplies, Oscilloscopes, and Multimeters • Introduction to Breadboarding and Circuit Building Techniques
Week 2	Lab 2: Building and Testing a Buck Converter: Design and build a buck converter circuit
Week 3	Lab 3: Building and Testing a Boost Converter: Design and build a buck converter circuit
Week 4	Lab 4: Building and Testing a Buck-Boost Converter: Design and build a buck converter circuit
Week 5	Lab 5: Building and Testing a Flyback Converter: Design and build a buck converter circuit
Week 6	Lab 6: Simulation of DC Power Converters using simulation software (e.g., MATLAB/Simulink)
Week 7, 8	Lab 7 and 8: simulate various DC power converter topologies
Week 9	Lab 9: Analyze and compare their performance characteristics (e.g., efficiency, voltage/current waveforms)
Week 10	Lab 10: DC-DC ONE- Quadrant
Week 11	Lab 11: DC-DC two- Quadrant
Week 12	Lab 12: DC-DC Four- Quadrant
Week 13	Lab 13: DC-DC ONE- Quadrant with DC Motor as a load

Week 14	Review

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	**Mohummed Rashid" Power electronics circuits, Devices and application" 4th edition, 2014.**	Yes
Recommended Texts		No
Websites		

APPENDIX:

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

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

Ministry of Higher Education and
Scientific Research - Iraq
Northern Technical University
Engineering Technical College/Mosul
Department of Electrical Engineering Techniques

MODULE DESCRIPTOR FORM

نموذج وصف المادة الدراسية

Module Information

معلومات المادة الدراسية

Module Title	**ELECTRICAL TRANSFORMERS AND INDUCTION MACHINES**	**Module Delivery**	
Module Type	CORE	✓ **Theory**	
Module Code	EET302	**Lecture**	
ECTS Credits	5	✓ **Lab**	
SWL (hr/sem)	**125**	**Tutorial**	
		✓ **Practical**	
		✓ **Seminar**	

Module Level	3	**Semester of Delivery**	1
Administering Department	**DEPARTMENT OF ELECTRICAL ENGINEERING TECHNIQUES**	**College**	**NORTHERN TECHNICAL UNIVERSITY ENGINEERING TECHNICAL COLLEGE/MOSUL**
Module Leader	Ahmed.J.ali	**e-mail**	ahmed.j.ali@ntu.edu.iq
Module Leader's Acad. Title	Assist.Professor	**Module Leader's Qualification**	Doctor
Module Tutor	None	**e-mail**	None
Peer Reviewer Name	None	**e-mail**	None
Review Committee Approval	14/06/2023	**Version Number**	1.0

Relation With Other Modules

العلاقة مع المواد الدراسية الأخرى

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

Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

Module Objectives أهداف المادة الدراسية	1-Understand the principles of operation of electrical transformers and induction machines, including the basic theory and working principles. 2-Analyze and calculate the performance characteristics of transformers and induction machines, such as voltage transformation, efficiency, losses, and regulation. 2- Select transformers and induction machines for specific applications, considering factors such as power requirements, voltage levels, and load characteristics. 3-Evaluate the efficiency and losses in transformers and induction machines, and identify methods to improve efficiency and reduce losses. 4-Recognize the different types and configurations of transformers and induction machines, and understand their advantages, limitations, and applications. 5-Apply troubleshooting techniques and maintenance practices for transformers and induction machines, including identifying common faults, conducting tests, and performing routine maintenance tasks.

	6-Understand the importance of energy efficiency and sustainability in transformer and motor selection, and evaluate the impact of transformers and induction machines on energy consumption. 7-Develop critical thinking and problem-solving skills by analyzing real-world scenarios and applying theoretical concepts to solve practical problems related to transformers and induction machines.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1-Describe the principles of operation of electrical transformers and induction machines. 2-Analyze and evaluate the performance characteristics of transformers, including voltage transformation, efficiency, losses, and regulation. 3-Analyze and evaluate the performance characteristics of induction machines, including torque-speed characteristics, starting methods, and slip. 4- induction machines for specific applications, considering factors such as power requirements, torque-speed requirements, and control methods. 5-Calculate and analyze the losses and efficiency of transformers and induction machines, and propose methods for improving efficiency and reducing losses. 6-Compare and contrast different types and configurations of transformers and induction machines, and evaluate their advantages, limitations, and applications.
Indicative Contents المحتويات الإرشادية	• Introduction to Electrical Transformers and Induction Machines: • Overview of transformers and induction machines. • Importance and applications in various industries. • Historical development and advancements. • Transformer Principles and Operation: • Transformer construction and components. • Magnetic circuits and core materials. • Electromagnetic induction and transformer action. • Ideal transformer model and equations. • Introduction to induction machines (squirrel cage and wound rotor). • Construction and components of induction machines. • Rotating magnetic field and slip. • Equivalent circuit model and phasor diagrams. • Torque-speed characteristics and starting methods (direct-on-line, star-delta, etc.). • Induction Machine Performance and Design: • Motor performance parameters: efficiency, power factor, and torque-speed characteristics. • Losses in induction machines: copper losses, iron losses, and mechanical losses. • Efficiency calculations and improvement methods. • Motor starting and speed control techniques: soft starters, variable frequency drives (VFDs), etc. • Motor selection and design considerations for specific applications. • Induction Machine Testing and Maintenance:

	• Motor efficiency assessment and energy-saving measures

Learning and Teaching Strategies
استراتيجيات التعلم والتعليم

Strategies	1. Lectures: In-class lectures can provide a comprehensive overview of the theoretical concepts, principles, and operating characteristics of electrical transformers and induction machines. Lectures can include visual aids, demonstrations, and examples to enhance understanding. 2. Practical Demonstrations: Hands-on demonstrations and experiments can be conducted to illustrate the operation and behavior of transformers and induction machines. This can help students visualize the concepts and gain practical insights into their functioning. 3. Problem-Solving Sessions: Dedicated problem-solving sessions can be conducted to apply the theoretical knowledge to solve numerical and analytical problems related to transformers and induction machines. This helps students develop critical thinking and problem-solving skills. 4. Case Studies: Real-world case studies can be presented to demonstrate the practical application of transformers and induction machines in various industries. Students can analyze and discuss these cases to understand the challenges, design considerations, and solutions implemented. 5. Computer Simulations and Virtual Laboratories: Utilizing computer simulations and virtual laboratories can provide a virtual environment for students to interact with transformers and induction machines. This enables them to explore different scenarios, conduct experiments, and observe the effects in a controlled setting. 6. Group Discussions and Debates: Organizing group discussions and debates on specific topics related to transformers and induction machines can encourage active participation and collaboration among students. This facilitates the exchange of ideas and perspectives, fostering a deeper understanding of the subject matter.

Student Workload (SWL)
الحمل الدراسي للطالب

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	78	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	5.2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	47	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	3.13
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	125		

Module Evaluation
تقييم المادة الدراسية

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

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
1	Introduction
2	Basic construction of electrical machines.
5	Theory of an ideal transformer.
6	Practical transformer.
7	Equivalent circuit of a loaded transformer.
8,9,10	Three phase - Transformer , Efficiency of a transformer , Parallel operation of single-phase transformer.
11	Three-phase induction motors
12,13	Equivalent circuit of induction motor , Power relations and Methods of starting of induction motors.
14	Speed control of induction motors.
15	• **Final Examination**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Practical Part
1	**Lab 1: open circuit test of single-phase transformer.**
2	**Lab 2: short circuit test of single-phase transformer.**
3	**Lab 3: Single Phase Transformer on Load Test (Resistive)**
4	**Lab 4: Single Phase Transformer on Load Test (Inductive)**
5	**Lab 5: Parallel Operation of Single-Phase Transformer**
6	**Lab 6: Three Phase Transformer Voltage and Current Ratio Test**
7	**Lab 7: Star-Delta Connection in Three Phase Transformer**
8	**Lab 8: Three phase induction motor no load test.**
9	**Lab 9: Three phase induction motor locked rotor test.**
10	**Lab 10: Three phase induction motor load test.**
11	**Lab 11: speed control for three phase induction motor (slip - ring).**
12	**Lab 12: speed control for three phase induction motor (squirrel cage).**
13	**Lab 13: star delta starting for three phase indication motor.**
14	**Lab 14: Rotor resistance starting for 3-Ph.I.M (slip-Ring).**

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	"ELECTRICAL MACHINERY AND TRANSFORMERS " by BBAG S.GURU , 3th Edition, 2001	Yes
Recommended Texts	"Electric Machinery Fundamentals" by Stephen J. Chapman 2000.	No
Websites	https://books.google.com/books?id=7DvhCgAAQBAJ&dq=principles+of+electric+machines+and+power+electronics&hl=ar&newbks=1&newbks_redir=1&sa=X&ved=2ahUKEwi1tv-N9cP_AhWFIMUKHQtfCw4Q6AF6BAgDEAI	

APPENDIX:

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

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

Ministry of Higher Education and
Scientific Research - Iraq
Northern Technical University
Engineering Technical College/Mosul
Department of Electrical Engineering Techniques

MODULE DESCRIPTOR FORM

نموذج وصف المادة الدراسية

Module Information

معلومات المادة الدراسية

Module Title	**ELECTROMAGNETIC FIELDS**	**Module Delivery**	
Module Type	CORE	✓ **Theory** **Lecture** ✓ **Lab** **Tutorial** ✓ **Practical** ✓ **Seminar**	
Module Code	**EET303**		
ECTS Credits	5		
SWL (hr/sem)	**125**		
Module Level	3	**Semester of Delivery**	1
Administering Department	**DEPARTMENT OF ELECTRICAL ENGINEERING TECHNIQUES**	**College**	**NORTHERN TECHNICAL UNIVERSITY ENGINEERING TECHNICAL COLLEGE/MOSUL**
Module Leader	Dr. Ahmed Abdul-Jalil Abdullah	**e-mail**	ahmedalkarakchi@ntu.edu.iq
Module Leader's Acad. Title	Lecturer	**Module Leader's Qualification**	Ph.D
Module Tutor	Laith Abdaljabbar Khalaf	**e-mail**	Laith.abd@ntu.edu.iq
Peer Reviewer Name	None	**e-mail**	None
Review Committee Approval	14/06/2023	**Version Number**	1.0

Relation With Other Modules

العلاقة مع المواد الدراسية الأخرى

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

Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

Module Objectives أهداف المادة الدراسية	1. **General review in vector and coordinate system**: Review the basic concepts of vectors and coordinate systems, including vector addition and subtraction, scalar multiplication, dot product, cross product, and coordinate transformations. 2. **Coulomb's law and electric field intensity**: Understand Coulomb's law and its application to point charges and continuous charge distributions. Understand the concept of electric field intensity and its relationship to Coulomb's law. 3. **Electric flux density and Gauss law**: Understand the concept of electric flux density and its relationship to electric field intensity. Understand Gauss's law and its application to calculating electric fields for symmetric charge distributions. 4. **Divergence and gradient theories**: Understand the concepts of divergence and gradient in vector calculus. Understand their applications in electrostatics. 5. **Energy potential and energy density in electric field**: Understand the concept of energy potential in electrostatics. Understand how to calculate energy density in an electric field. 6. **Current density and electric boundary conditions**: Understand the concept of current density in electrostatics. Understand the boundary conditions for electric fields at interfaces between different materials.

	7. **Resistance and capacitance**: Understand the concepts of resistance and capacitance in circuits. Be able to solve problems involving resistors and capacitors in series and parallel. 8. **Poisson's and Laplace equations application and examples**: Understand Poisson's equation and Laplace's equation in electrostatics. Be able to solve problems involving these equations for simple charge distributions. 9. **Biot-Savart law, Ampere's law, and curl**: Understand Biot-Savart's law for calculating magnetic fields due to current-carrying wires. Understand Ampere's law for calculating magnetic fields around closed loops. Understand the concept of curl in vector calculus. 10. **Magnetic field intensity and magnetic flux density**: Understand the concept of magnetic field intensity and its relationship to magnetic force on moving charges. Understand the concept of magnetic flux density and its relationship to magnetic fields. 11. **Scalar and vector magnetic potential**: Understand the concepts of scalar potential and vector potential in magnetostatics. 12. **Magnetic force, magnetic boundary conditions, and inductance**: Understand the force on a moving charge in a magnetic field. Understand the boundary conditions for magnetic fields at interfaces between different materials. Understand the concept of inductance in circuits. 13. **Faraday's law, displacement current, Maxwell's equations in potential and integral form**: Understand Faraday's law of electromagnetic induction. Understand displacement current as an extension of Ampere's law. Be able to derive Maxwell's equations from these concepts.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. **General review in vector and coordinate system**: Understand the basic concepts of vectors and coordinate systems, including vector addition and subtraction, scalar multiplication, dot product, cross product, and coordinate transformations. 2. **Coulomb's law and electric field intensity**: Understand Coulomb's law and its application to point charges and continuous charge distributions. Understand the concept of electric field intensity and its relationship to Coulomb's law. 3. **Electric flux density and Gauss law**: Understand the concept of electric flux density and its relationship to electric field intensity. Understand Gauss's law and its application to calculating electric fields for symmetric charge distributions. 4. **Divergence and gradient theories**: Understand the concepts of divergence and gradient in vector calculus. Understand their applications in electrostatics. 5. **Energy potential and energy density in electric field**: Understand the concept of energy potential in electrostatics. Understand how to calculate energy density in an electric field. 6. **Current density and electric boundary conditions**: Understand the concept of current density in electrostatics. Understand the boundary conditions for electric fields at interfaces between different materials. 7. **Resistance and capacitance**: Understand the concepts of resistance and capacitance in circuits. Be able to solve problems involving resistors and capacitors in series and parallel. 8. **Poisson's and Laplace equations application and examples**: Understand Poisson's equation and Laplace's equation in electrostatics. Be able to solve problems involving these equations for simple charge distributions. 9. **Biot-Savart law, Ampere's law, and curl**: Understand Biot-Savart's law for calculating magnetic fields due to current-carrying wires. Understand Ampere's law for calculating magnetic fields around closed loops. Understand the concept of curl in vector calculus. 10. **Magnetic field intensity and magnetic flux density**: Understand the concept of magnetic field intensity and its relationship to magnetic force on moving charges.

	Understand the concept of magnetic flux density and its relationship to magnetic fields. 11. **Scalar and vector magnetic potential**: Understand the concepts of scalar potential and vector potential in magnetostatics. 12. **Magnetic force, magnetic boundary conditions, and inductance**: Understand the force on a moving charge in a magnetic field. Understand the boundary conditions for magnetic fields at interfaces between different materials. Understand the concept of inductance in circuits. 13. **Faraday's law, displacement current, Maxwell's equations in potential and integral form**: Understand Faraday's law of electromagnetic induction. Understand displacement current as an extension of Ampere's law. Be able to derive Maxwell's equations from these concepts.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following: • Part A – General Vector and coordinate System. This section provides an overview of vectors and coordinate systems, including vector addition and subtraction, scalar multiplication, dot product, cross product, and coordinate transformations. [8 hrs] • Part B Electric fields. Coulomb's law and its application to point charges and continuous charge distributions. Electric flux density and its relationship to electric field intensity. Divergence and gradient in vector calculus. Energy potential and current density in electrostatics. Resistance and capacitance in circuits. Poisson's equation and Laplace's equation in electrostatics. [30 hrs] • Part C Magnetic fields Biot-Savart's law. Magnetic field intensity and magnetic flux density. Scalar potential and vector potential in magnetostatics. Magnetic force, magnetic boundary conditions, and inductance. [12 hrs] • Revision problem classes [6 hrs]

Learning and Teaching Strategies
استراتيجيات التعلم والتعليم

Strategies	**General review in vector and coordinate system**: Start by reviewing basic vector algebra and coordinate systems. Practice vector addition and subtraction, scalar multiplication, dot product, cross product, and coordinate transformations. **Coulomb's law and electric field intensity**: Understand the concept of electric charge and how it relates to electric fields. Practice applying Coulomb's law to point charges and continuous charge distributions. **Electric flux density and Gauss law**: Understand the concept of electric flux density and how it relates to electric field intensity. Practice applying Gauss's law to calculate electric fields for symmetric charge distributions. **Divergence and gradient theories**: Review the concepts of divergence and gradient in vector calculus. **Energy potential and energy density in electric field**: Understand the concept of energy potential in electrostatics. Learn how to calculate energy density in an electric field. **Current density and electric boundary conditions**: Understand the concept of current density in electrostatics. Learn the boundary conditions for electric fields at interfaces between different materials. **Resistance and capacitance**: Understand the concepts of resistance and capacitance in circuits. Practice solving problems involving resistors and capacitors in series and parallel.

	Poisson's and Laplace equations application and examples: Understand Poisson's equation and Laplace's equation in electrostatics. **Biot-Savart law, Ampere's law, and curl**: Understand Biot-Savart's law for calculating magnetic fields due to current-carrying wires. **Magnetic field intensity and magnetic flux density**: Understand the concept of magnetic field intensity and its relationship to magnetic force on moving charges. **Scalar and vector magnetic potential**: Understand the concepts of scalar potential and vector potential in magnetostatics. **Magnetic force, magnetic boundary conditions, and inductance**: Understand the force on a moving charge in a magnetic field. Learn the boundary conditions for magnetic fields at interfaces between different materials.

Student Workload (SWL)
الحمل الدراسي للطالب

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	93	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	6.2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	32	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	2.1
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	125		

Module Evaluation
تقييم المادة الدراسية

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

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
1, 2	General review in vector and coordinate system.
3	Coulombs law and electric field intensity.
4	Electric flux density and Gauss law.
5	Divergence and gradient theories.
6	Energy potential and energy density in electric field.
7	Current density and electric boundary conditions.
8	Several examples on resistance and capacitances use of it.
9	Poisons and Laplace equations application and examples.
10	Biot- savant law and ampere law and curl.
11	Magnetic field intensity and magnetic flux density.
12	The scalar and vector magnetic potential.
13	Magnetic force, magnetic boundary conditions and inductance.
14	Faradays law, displacement current and Maxwell's equations in potential and integral form.
15	Final Examination

Delivery Plan (Weekly Lab. Syllabus)
المنهاج الاسبوعي للمختبر

	Material Covered
1	LAB 1: INTRODUCTION TO MATLAB PROGRAM AND M FILE
2	LAB 2: VECTOR ANALYSIS
3	LAB 3: SURFACE INTEGRALS
4	LAB 4: VOLUME INTEGRALS
5	LAB 5: E FIELD OF LINEAR CHARGE
6	LAB 6: E FIELD OF SURFACE CHARGES
7	LAB7: ELECTRIC FLUX DENSITY
8	LAB 8: ELECTRIC FLUX THROUGH A SURFACE
9	LAB9: ELECTRIC POTENTIAL
10	LAB10: ELECTRIC ENERGY
11	LAB 11: ELECTRIC CURRENT
12	LAB12: BOUNDARY CONDITIONS
13	LAB 13: CAPACITANCE
14	Review

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Engineering Electromagnetics - William_Hayt, 2010.	Yes
Recommended Texts	Electromagnetics – Schaum's series	No
Websites	No	

APPENDIX:

GRADING SCHEME
مخطط الدرجات

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

Note:

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

Ministry of Higher Education and
Scientific Research - Iraq
Northern Technical University
Engineering Technical College/Mosul
Department of Electrical Engineering Techniques

MODULE DESCRIPTOR FORM

نموذج وصف المادة الدراسية

Module Information

معلومات المادة الدراسية

Module Title	**MICROPROCESSOR**	**Module Delivery**	
Module Type	CORE	✓ **Theory** **Lecture** ✓ **Lab** **Tutorial** ✓ **Practical** ✓ **Seminar**	
Module Code	EET304		
ECTS Credits	5		
SWL (hr/sem)	125		
Module Level	3	**Semester of Delivery**	1
Administering Department	**DEPARTMENT OF ELECTRICAL ENGINEERING TECHNIQUES**	**College**	**NORTHERN TECHNICAL UNIVERSITY ENGINEERING TECHNICAL COLLEGE/MOSUL**
Module Leader	Bashar Abdullah Hamad	**e-mail**	bashar.hamad@ntu.edu.iq
Module Leader's Acad. Title	Lecturer	**Module Leader's Qualification**	Master
Module Tutor	None	**e-mail**	None
Peer Reviewer Name	None	**e-mail**	None
Review Committee Approval	14/06/2023	**Version Number**	1.0

Relation With Other Modules

العلاقة مع المواد الدراسية الأخرى

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

Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

Module Objectives أهداف المادة الدراسية	The course objective is to introduce the operation, programming, and application of microprocessor
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1- Analyze the functional block of the 8086 microprocessors. 2- Write an assembly language program for the given problem. 3- Use instructions for different addressing modes. 4- Develop an assembly language program using assembler.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following: • Part A – Introduction to Microcomputers. Introduction to Microcomputers; Microprocessor vs. Microcontrollers. Introduction to Microprocessor-Based System Design. Microprocessor Memories, Memory Operation

	Microprocessor System, Need for memory segmentation, Microprocessor Architecture, Bus Interfacing Unit (BIU), Execution Unit (EU). Addressing Modes, Assembly language, Mnemonics, Assembler program Different Instruction Types, Data Transfer, Shift Instruction, Examples The Programmable Peripheral Interface (PPI). [20 hrs] • Part B Programmable logic controller (PLC). Programmable logic controller (PLC), Advantages of PLC, Architecture of PLC, Mechanical design of PLC How does a PLC operate? What are input/output devices Programming Language for PLC, Ladder Logic, Functional block diagram (FBD), Instruction list Examples on Programming PLC [10 hrs]

Learning and Teaching Strategies
استراتيجيات التعلم والتعليم

Strategies	1-**Hands-on Experiments:** Engage students in practical experiments to deepen their understanding of the operation, programming, and application of microprocessor. 2-**Simulation Software:** Simulation Software: Use proteus software for virtual circuit design and programming based on a microprocessor. 3-**Problem-solving Exercises:** Include various problem-solving exercises for programming and the application of microprocessor techniques. 4-**Group Projects:** Assign collaborative projects for programming, and application of microprocessors. 5-**Real-world Applications:** Discuss practical applications of microprocessors in different devices and systems. 5-**Interactive Discussions:** Encourage student participation and critical thinking through open-ended questions. 6-**Conceptual Understanding:** Focus on intuitive understanding alongside mathematical analysis. 7-**Assessment Variety:** Use diverse assessment methods to gauge student understanding. 8-**Office Hours and Support:** Offer individualized assistance through office hours or online support.

Student Workload (SWL)
الحمل الدراسي للطالب

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

Module Evaluation
تقييم المادة الدراسية

	Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome

Formative assessment	**Quizzes**	4	10% (10)	2, 12	LO # 3, and 4
	Assignments	8	10% (10)	2, 12	LO # 3, and 4
	Projects / Lab.	7	10% (10)	2, 12	LO # 2, and 4
	Report	8	10% (10)	2, 12	All
Summative assessment	**Midterm Exam**	2 hr	10% (10)	8	LO # 1-4
	Final Exam	3 hr	50% (50)	15	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
1,2	• **Introduction to Microcomputers; Microprocessor vs. Microcontrollers. Introduction to Microprocessor-Based System Design.**
3,4	**Microprocessor Memories, Memory Operation, Read Only Memories (ROM), RAM Architecture, Dynamic RAM structure and operation**
5	**Microprocessor System, Need for memory segmentation, Microprocessor Architecture, Bus Interfacing Unit (BIU), Execution Unit (EU), Segment Group:, DATA Group Registers**
6,7	**Addressing Modes, Assembly language, Mnemonics, Assembler program,**
8,9	**Different Instruction Types, Data Transfer, Shift Instruction, Examples**
10	**The Programmable Peripheral Interface (PPI)**
11	**Programable logic controller (PLC), Advantages of PLC, Architecture of PLC, Mechanical design of PLC**
12	**How does a PLC operate? What are input/output devices?**
13,14	**Programming Language for PLC , Ladder Logic, Functional block diagram (FBD), Instruction list, Examples on Programming PLC**
15	• **Final Examination**

Delivery Plan (Weekly Lab. Syllabus)
المنهاج الاسبوعي للمختبر

	Material Covered
1	**Lab 1: Identify various pins of the given Microprocessor.**
2	**Lab 2: Use Assembly Language Programming Tools and functions**
3	**Lab 3: Use different addressing mode instruction in program** **Write an Assembly Language Program (ALP) to add two given 8 and 16 bits numbers** **Write an Assembly Language Program (ALP) to subtract two given 8 and 16 bits numbers**
4	**Lab 4: (a) Write an Assembly Language Program (ALP) to multiply two given 8 and 16 bits unsigned numbers** **(b)Write an Assembly Language Program (ALP) to multiply two given 8 and 16 bits signed numbers**
5	**Lab 5: (a) Write an Assembly Language Program (ALP) to divide two given 8 and 16 bits unsigned numbers** **(b)Write an Assembly Language Program (ALP) to divide two given 8 and 16 bits signed numbers**
6	**Lab 6: Write an Assembly Language Program (ALP) to add, subtract, multiply, and divide two BCD numbers.**
7	**Lab 7: Implement loop in assembly language program**

	Write an Assembly Language Program (ALP) to sum of series of Hexadecimal numbers. **(b) Write an Assembly Language Program (ALP) to sum of series of BCD numbers.**
8	**Lab 8: (a) Write an Assembly Language Program (ALP) to find the smallest number from an array of n numbers.** **(b)Write an Assembly Language Program (ALP) to find the largest number from an array of n numbers**
9	**Lab 9: (a) Write an Assembly Language Program (ALP) to arrange numbers in an array in ascending order.** **(b)Write an Assembly Language Program (ALP) to arrange numbers in an array in descending order.**
10	**Lab 10: (a) Write an Assembly Language Program (ALP) to arrange elements string in reverse order.** **(b) Write an Assembly Language Program (ALP) to find string length.**
11	**Lab 11: (a) Write an Assembly Language Program (ALP) to check whether a given number is an ODD or EVEN.** **(b) Write an Assembly Language Program (ALP) to count ODD and/or EVEN numbers in an array.**
12	**Lab 12: (a) Write an Assembly Language Program (ALP) to check whether a given number is a POSITIVE or NEGATIVE.** **(b) Write an Assembly Language Program (ALP) to count POSITIVE and/or NEGATIVE numbers in an array**
13	**Lab 13: (a) Write an Assembly Language Program (ALP) to count the number of '1' in a given number.** **(b) Write an Assembly Language Program (ALP) to count the number of '0' in a given number.**
14	**Lab 14: Review**

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Hall, Douglas V. MICROPROCESSORS AND INTERFACING. 1992.	Yes
Recommended Texts	Walter A. Triebel, Avtar Singh. The 8088 and 8086 Microprocessors: Programming, Interfacing, Software, Hardware, and Applications (4th Edition) - Instructor's Solution Manual [4th ed.] 0130930814, 9780130930811. Prentice Hall 2002	No

Websites	Assembly_Programming https://www.tutorialspoint.com/assembly_programming/index.htm

APPENDIX:

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

Note:

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

Ministry of Higher Education and
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Northern Technical University
Engineering Technical College/Mosul
Department of Electrical Engineering Techniques

MODULE DESCRIPTOR FORM

نموذج وصف المادة الدراسية

Module Information

معلومات المادة الدراسية

Module Title	**NUMERICAL ANALYSIS**	**Module Delivery**	
Module Type	BASIC	✓ **Theory**	
Module Code	EET305	**Lecture**	
ECTS Credits	5	✓ **Lab**	
SWL (hr/sem)	125	**Tutorial**	
		✓ **Practical**	
		✓ **Seminar**	

Module Level	3	**Semester of Delivery**	1
Administering Department	**DEPARTMENT OF ELECTRICAL ENGINEERING TECHNIQUES**	**College**	**NORTHERN TECHNICAL UNIVERSITY ENGINEERING TECHNICAL COLLEGE/MOSUL**
Module Leader	Ahmed M. T. Ibraheem	**e-mail**	ahmed_alnaib2018@ntu.edu.iq
Module Leader's Acad. Title	Assist. Professor	**Module Leader's Qualification**	Master
Module Tutor	None	**e-mail**	None
Peer Reviewer Name	None	**e-mail**	None
Review Committee Approval	15/06/2023	**Version Number**	1.0

Relation With Other Modules

العلاقة مع المواد الدراسية الأخرى

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

Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

Module Objectives أهداف المادة الدراسية	1- Understanding Approximation and Errors: Numerical Analysis helps in understanding the concept of approximation and the types of errors involved in numerical computations. It explores how errors propagate and affect the accuracy of numerical solutions. 2- Studying Numerical Algorithms: Numerical Analysis involves the study and analysis of various numerical algorithms used for solving mathematical problems. This includes algorithms for root finding, interpolation, numerical integration, linear and nonlinear systems of equations, optimization, and differential equations. 3- Analyzing Convergence and Stability: Numerical Analysis investigates the convergence and stability properties of numerical methods. It focuses on understanding when and under what conditions the numerical algorithms produce accurate and reliable results. 4- Implementing Numerical Methods: Numerical Analysis aims to develop practical skills in implementing numerical methods on computers. This involves coding algorithms, using appropriate programming languages and libraries, and understanding computational complexities and efficiency.

	5- Error Analysis and Estimation: Numerical Analysis provides techniques for estimating and analyzing errors in numerical computations. It helps in assessing the accuracy and reliability of numerical solutions and provides insights into improving the computational results.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1- Knowledge of Numerical Methods: Understand and describe a variety of numerical methods used in solving mathematical problems, including root finding, 2- interpolation, numerical integration, linear and nonlinear systems of equations, 3- optimization, and differential equations. 4- Algorithm Analysis and Selection: Analyze the strengths, weaknesses, convergence properties, 5- computational complexities of numerical algorithms. 6- Evaluate different numerical methods and select the most appropriate algorithm for solving specific mathematical problems.
Indicative Contents المحتويات الإرشادية	The indicative contents of a Numerical Analysis module may include the following topics: • Introduction to Numerical Analysis: Overview of numerical methods and their importance in solving mathematical problems Sources of errors in numerical computations Overview of computer arithmetic and representation of numbers • Root Finding Methods: Bisection method Newton-Raphson method Secant method Fixed-point iteration Comparison and convergence analysis of root finding methods • Interpolation and Approximation: Polynomial interpolation (Lagrange and Newton forms) Divided differences and interpolating polynomials Least squares approximation Splines and piecewise interpolation Error estimation in interpolation and approximation • Numerical Integration: Trapezoidal rule Simpson's rule

Learning and Teaching Strategies
استراتيجيات التعلم والتعليم

Strategies	1-**Hands-on Experiments:** Engage students in practical experiments to deepen their understanding of circuits. 2-**Simulation Software:** Use circuit simulation software for virtual circuit design and analysis. 3-**Problem-solving Exercises:** Include various problem-solving exercises to apply circuit analysis techniques. 4-**Group Projects:** Assign collaborative projects for circuit design and construction. 5-**Real-world Applications:** Discuss practical applications of circuits in different

	devices and systems. 5-**Interactive Discussions:** Encourage student participation and critical thinking through open-ended questions. 6-**Conceptual Understanding:** Focus on intuitive understanding alongside mathematical analysis. 7-**Assessment Variety:** Use diverse assessment methods to gauge student understanding. 8-**Office Hours and Support:** Offer individualized assistance through office hours or online support.

Student Workload (SWL)
الحمل الدراسي للطالب

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	63	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4.2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	62	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	4.133
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	125		

Module Evaluation
تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	4	10% (10)	5, 10	LO #1, 2and 6
	Assignments	8	10% (10)	2, 12	LO # 3-5
	Projects / Lab.	0			
	Report	3	10% (10)	2, 12	LO # 5,6
Summative assessment	**Midterm Exam**	2 hr	10% (10)	8	LO # 1-6
	Final Exam	3 hr	50% (50)	15	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
1	**Numerical Solution of Linear Algebraic Systems (Direct Methods):** Gaussian Elimination Method/ Gauss Jordan Method
2	**Numerical Solution of Linear Algebraic Systems (Indirect Methods):** Jacob's Method/ Gauss-Seidel Method
3	**Numerical Solution of Non-Linear Algebraic Systems:** Graphical Method/ Bisection Method
4	**Numerical Solution of Non-Linear Algebraic Systems:** False Position Method
5	**Numerical Solution of Non-Linear Algebraic Systems:** Secant Method
6	**Numerical Solution of Non-Linear Algebraic Systems:** Newton-Raphson Method
7	**Numerical Solution of Non-Linear Algebraic Systems:** Modified Newton-Raphson Method for Multiple Roots
8	**Numerical Differentiation:** Derivatives estimation, Richardson Extrapolation, Newtown forward formula and Sterling Formula
9	**Numerical Integration:** Trapezoid Rule, and Composite Trapezoid Rule
10	**Numerical Integration:** Simpson's Rule, and Composite Simpson's Rule
11	**Numerical Integration:** Error in Numerical Integration
12	**Fourier Series:** Even and odd functions and half-range Fourier series
13	**Fourier Series:** A numerical method of harmonic analysis.

14	**Curve Fitting**
15	**Final Examination**

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	"Numerical Analysis", Ninth Edition. Richard L. Burden and J. Douglas Faires. Editor-in-Chief: Michelle Julet. Publisher: Richard Stratton.	Yes
Recommended Texts	"Analysis of Numerical Methods", by Eugene Isaacson, and Herbert Bishop Keller	No
Websites	https://www.youtube.com/watch?v=UF3ZyqKbjl4	

APPENDIX:

GRADING SCHEME
مخطط الدرجات

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

Note:

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

Ministry of Higher Education and
Scientific Research - Iraq
Northern Technical University
Engineering Technical College/Mosul
Department of Electrical Engineering Techniques

MODULE DESCRIPTOR FORM

نموذج وصف المادة الدراسية

Module Information

معلومات المادة الدراسية

Module Title	**ADVANCED POWER ENGINEERING**	**Module Delivery**	
Module Type	CORE	✓ **Theory**	
Module Code	EET306	**Lecture**	
ECTS Credits	5	✓ **Lab**	
SWL (hr/sem)	125	**Tutorial**	
		✓ **Practical**	
		✓ **Seminar**	

Module Level	3	**Semester of Delivery**	2
Administering Department	**DEPARTMENT OF ELECTRICAL ENGINEERING TECHNIQUES**	**College**	**NORTHERN TECHNICAL UNIVERSITY ENGINEERING TECHNICAL COLLEGE/MOSUL**
Module Leader	Mohammed Yahya	**e-mail**	mohammed.yahya@ntu.edu.iq
Module Leader's Acad. Title	Professor	**Module Leader's Qualification**	PhD
Module Tutor	None	**e-mail**	None
Peer Reviewer Name	None	**e-mail**	None
Review Committee Approval	14/06/2023	**Version Number**	1.0

Relation With Other Modules

العلاقة مع المواد الدراسية الأخرى

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

Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

Module Objectives
أهداف المادة الدراسية

The aim of the module on Basic Electrical Power Engineering is to provide students with a foundational understanding of the principles, concepts, and applications related to electrical power systems. The module aims to introduce students to the fundamental knowledge and skills necessary for further study and specialization in electrical power engineering.

Learning Outcomes:

1- Demonstrate a basic understanding of electrical power systems, their components, and their operation.
2- Apply fundamental mathematical and analytical techniques to solve basic problems in power systems.
3- Recognize and explain the different types of power generation, transmission, and distribution technologies.
4- Identify basic safety considerations and regulations in electrical power engineering.
5- Demonstrate effective communication of basic electrical power engineering concepts, both orally and in written form.

Indicative Contents:

	Introduction to Electrical Power Systems: Overview of electrical power systems and their components. Basic concepts and definitions in electrical power engineering. Circuit Analysis Techniques: Introduction to different types of power generation, such as thermal, hydro, and renewable. Overview of power plants and their operation. Power Transmission and Distribution: Introduction to transmission and distribution systems. Overview of transformers, transmission lines, and distribution networks. Safety and Regulations
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1- Demonstrate a basic understanding of electrical power systems, including their components, operation, and key principles. 2- Apply fundamental mathematical and analytical techniques to solve basic problems in electrical circuits and power systems. 3- Recognize and explain the various types of power generation, 4- transmission, and distribution technologies used in electrical power systems. 5- Understand and adhere to basic safety considerations and regulations in electrical power engineering.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following: • Part A – Transmission line performance. Transmission line performance: Short line,Transmission line performance: Medium line, General Network Constants A,B,C and D, [20 hrs] • Part B Underground cables. Underground cables construction, types of cables, operating voltage, stress of cables methods of decreasing stress [10 hrs] • Part C Symmetrical components and sequences Symmetrical components +ve, -ve and zero sequence the circuit in unbalance condition analysis at unbalance condition [20 hrs] • Part D HVDC High voltage DC converter, filters, transmitting and receiving power transmission on DC [8 hrs] • Revision problem classes [2 hrs]

Learning and Teaching Strategies
استراتيجيات التعلم والتعليم

Strategies	1-**Hands-on Experiments:** Engage students in practical experiments to deepen their understanding of circuits. 2-**Simulation Software:** Use circuit simulation software for virtual circuit design and analysis. 3-**Problem-solving Exercises:** Include various problem-solving exercises to apply circuit analysis techniques. 4-**Group Projects:** Assign collaborative projects for circuit design and construction. 5-**Real-world Applications:** Discuss practical applications of circuits in different

	devices and systems. 5-**Interactive Discussions:** Encourage student participation and critical thinking through open-ended questions. 6-**Conceptual Understanding:** Focus on intuitive understanding alongside mathematical analysis. 7-**Assessment Variety:** Use diverse assessment methods to gauge student understanding. 8-**Office Hours and Support:** Offer individualized assistance through office hours or online support.

Student Workload (SWL)
الحمل الدراسي للطالب

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	63	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4.2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	62	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	4.13
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	125		

Module Evaluation
تقييم المادة الدراسية

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

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
1	Transmission line performance: Short line
2,3	Transmission line performance: Medium line
4,5	General Network Constants A,B,C and D
6,7	Underground Cables
8,9	Symmetrical Components
10,11,12	Positive, Negative, and Zero sequence reactance diagram
13,14	HVDC Transmission system
15	Final Examination

Delivery Plan (Weekly Lab. Syllabus)
المنهاج الاسبوعي للمختبر

	Material Covered
1	Transmission line model loading capacitive load
2	Calculation of the parameter for three-phase transformers
3	Visit to transforming sub-station
4	Line characteristic for resistive load

5	Line characteristic for inductive load
6	Line characteristic for capacitive load
7	Voltage drop in the transmission line
8	Visit to diesel generating station
9	Determination of sequence current
10	Visit to gas turbine generating station
11	Oil test
12	Visit to hydroelectric generating station
13	Visit to thermal generating station
14	Review

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	P. V. Gupta, M. L. Soni, A course in Electrical Power	Yes
Recommended Texts	P. V. Gupta, Transmission and Distribution	No
Websites	https://books.google.iq/books/about/A_Course_in_Electrical_Power.html?id=j3B5AQAACAAJ&redir_esc=y	

APPENDIX:

GRADING SCHEME
مخطط الدرجات

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

Note:

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

Ministry of Higher Education and
Scientific Research - Iraq
Northern Technical University
Engineering Technical College/Mosul
Department of Electrical Engineering Techniques

MODULE DESCRIPTOR FORM
نموذج وصف المادة الدراسية

Module Information
معلومات المادة الدراسية

Module Title	**AC POWER CONVERTER**	**Module Delivery**	
Module Type	CORE	✓ **Theory** **Lecture** ✓ **Lab** **Tutorial** ✓ **Practical** ✓ **Seminar**	
Module Code	**EET307**		
ECTS Credits	5		
SWL (hr/sem)	125		
Module Level	3	**Semester of Delivery**	2
Administering Department	**DEPARTMENT OF ELECTRICAL ENGINEERING TECHNIQUES**	**College**	**NORTHERN TECHNICAL UNIVERSITY ENGINEERING TECHNICAL COLLEGE/MOSUL**
Module Leader	Rakan Khalil ANTAR	**e-mail**	Rakan.antar@ntu.edu.iq
Module Leader's Acad. Title	Asst. Prof	**Module Leader's Qualification**	PhD
Module Tutor	None	**e-mail**	None
Peer Reviewer Name	None	**e-mail**	None
Review Committee Approval	13/06/2023	**Version Number**	1.0

Relation With Other Modules
العلاقة مع المواد الدراسية الأخرى

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

Module Aims, Learning Outcomes and Indicative Contents
أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

Module Objectives
أهداف المادة الدراسية

Students will learn the principle of ;

1. Understand the fundamental principles of AC power conversion, including AC voltage and current characteristics, power factor, and three-phase systems.
2. Identify and analyze different AC power converter topologies, such as rectifiers, inverters, and AC-DC and DC-AC converters, understanding their working principles, advantages, and limitations.
3. Design and analyze AC power converters for specific applications, considering parameters such as input and output voltage and current requirements, power factor correction, efficiency, and harmonic content. Select appropriate

components and control strategies for achieving desired performance specifications.

4. Develop proficiency in modeling and simulation techniques for AC power converters, using software tools or programming languages to analyze converter behavior under different operating conditions, evaluate performance metrics, and predict harmonic distortion.
5. Understand various control techniques used in AC power converters, such as pulse width modulation (PWM), sinusoidal pulse width modulation (SPWM), and space vector modulation (SVM). Analyze the stability and dynamic response of control loops.
6. Familiarize with passive and active components used in AC power converters, including transformers, capacitors, diodes, IGBTs, and thyristors. Understand their characteristics, selection criteria, and their impact on converter performance and reliability.
7. Gain awareness of practical considerations and challenges associated with AC power converter implementation, such as thermal management, electromagnetic interference (EMI), grid synchronization, and protection mechanisms. Learn techniques to mitigate these issues.
8. Evaluate the efficiency and power quality aspects of AC power converters, including efficiency calculations, harmonic content analysis, power factor correction, and techniques to reduce switching losses and improve grid integration.
9. Understand the integration of AC power converters in larger systems, such as renewable energy systems, electric grid interfaces, motor drives, and uninterruptible power supplies (UPS). Gain awareness of the interaction between converters and other system components.
10. Develop troubleshooting and problem-solving skills to diagnose and rectify issues related to AC power converters. Analyze and interpret experimental data, identify sources of errors or failures, and propose solutions.

By achieving these module objectives, students will gain a comprehensive understanding of AC power converters, enabling them to design, analyze, and implement efficient and reliable power conversion systems in various AC power applications.

Module Learning Outcomes مخرجات التعلم للمادة الدراسية	Upon completing the AC power converter module, students should be able to: 1. Explain the fundamental principles of AC power conversion, including AC voltage and current characteristics, power factor, and three-phase systems.

	2. Analyze and compare different AC power converter topologies, such as rectifiers, inverters, and AC-DC and DC-AC converters, in terms of their operation, advantages, and limitations. 3. Design and simulate AC power converters for specific applications, considering input and output voltage and current requirements, power factor correction, efficiency, and harmonic content. 4. Apply control techniques, such as pulse width modulation (PWM), sinusoidal pulse width modulation (SPWM), and space vector modulation (SVM), to regulate the output of AC power converters and achieve desired performance characteristics. 5. Evaluate and optimize the efficiency and power quality aspects of AC power converters, including efficiency calculations, harmonic content analysis, power factor correction, and techniques to reduce switching losses. 6. Select and analyze the appropriate passive and active components, such as transformers, capacitors, diodes, IGBTs, and thyristors, for AC power converter design, considering their characteristics, ratings, and impact on performance. 7. Demonstrate an understanding of practical considerations and challenges related to AC power converter implementation, including thermal management, electromagnetic interference (EMI), grid synchronization, and protection mechanisms. 8. Analyze and interpret experimental data obtained from AC power converter testing and troubleshooting activities, identify sources of errors or failures, and propose appropriate solutions. 9. Evaluate the integration of AC power converters into larger systems, such as renewable energy systems, electric grid interfaces, motor drives, and uninterruptible power supplies (UPS), considering the interaction between converters and other system components. 10. Demonstrate effective communication skills by presenting and explaining AC power converter designs, simulations, experimental results, and solutions to technical problems. Overall, the module aims to equip students with the knowledge, skills, and practical experience necessary to design, analyze, and implement AC power converters for various applications, while considering efficiency, power quality, and system integration aspects.
Indicative Contents المحتويات الإرشادية	1. AC-DC Rectifiers: Half-wave and full-wave rectifiers Diode rectifiers Controlled rectifiers Single-phase and three-phase rectifiers 2. DC-AC Inverters:

	Single-phase and three-phase inverters Pulse width modulation (PWM) techniques for inverter control Harmonic content analysis and filtering in inverters
	3. AC-AC Converters:
	AC voltage and current characteristics Cycloconverters and matrix converters Control strategies for AC-AC converters Applications and advantages of AC-AC converters
	4. Multilevel Converters:
	Diode-clamped and cascaded H-bridge multilevel converters Pulse width modulation techniques for multilevel converters Advantages and applications of multilevel converters
	5. Resonant Converters:
	Series and parallel resonant converters Zero-voltage and zero-current switching techniques Soft-switching and high-frequency operation
	6. Grid-Connected Power Converters:
	Grid synchronization and grid integration requirements Grid-tied inverters for renewable energy systems Power quality and reactive power compensation in grid-connected converters
	7. Control Techniques for AC Power Converters:
	Pulse width modulation (PWM) strategies Sinusoidal pulse width modulation (SPWM) Space vector modulation (SVM) techniques
	8. Emerging Trends in AC Power Conversion:
	High-frequency and high-power-density AC power converters Application-specific power converter designs (e.g., electric vehicles, renewable energy systems)
	Note: The above indicative contents provide a broad overview of the topics typically covered in an AC power converter course. The specific depth and coverage of each topic can vary depending on the course level and duration. The contents can be adjusted or expanded based on the curriculum and the instructor's expertise and preferences.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	1. Lectures: Conduct lectures to introduce and explain the theoretical concepts, principles, and working mechanisms of AC power converters. Use visual aids such as slides, diagrams, and animations to enhance understanding.

2. Practical Demonstrations: Organize practical demonstrations to showcase the operation of AC power converters in real-world applications. This can include demonstrating the working of rectifiers, inverters, and other AC power conversion circuits using appropriate laboratory equipment.
3. Hands-on Lab Experiments: Provide students with hands-on experience by conducting laboratory experiments on AC power converters. Students can design, build, and test different converter topologies, measure performance parameters, and analyze the results. This will help reinforce theoretical concepts and develop practical skills.
4. Simulation Exercises: Utilize simulation software tools, such as MATLAB/Simulink or PSpice, to simulate AC power converter circuits and systems. Assign simulation exercises to students, allowing them to explore different scenarios, analyze performance, and validate theoretical concepts.
5. Case Studies: Present case studies of real-world AC power converter applications, such as renewable energy systems or motor drives. Discuss the design considerations, challenges faced, and the solutions implemented in these applications. Encourage students to analyze and propose improvements to the existing systems.
6. Group Projects: Assign group projects that require students to design and implement AC power converters for specific applications. This can involve selecting appropriate converter topologies, designing control strategies, and optimizing performance. Emphasize teamwork, problem-solving, and presentation skills.
7. Guest Speakers: Invite industry professionals or experts in AC power converters to deliver guest lectures or participate in panel discussions. They can share their practical experiences, current trends, and challenges in the field, providing valuable insights to students.
8. Problem-Solving Sessions: Organize problem-solving sessions or tutorials where students can discuss and solve challenging problems related to AC power converters. Encourage active participation, critical thinking, and collaboration among students.
9. Online Resources: Provide access to online resources, such as textbooks, research papers, and video lectures, to supplement classroom learning. Encourage students to explore these resources to deepen their understanding and gain additional knowledge.
10. Assessments: Conduct regular assessments, including quizzes, assignments, and exams, to evaluate students' understanding of AC power converters. Assessments should test both theoretical knowledge and practical application skills.
11. Industry Visits or Internships: Arrange visits to power electronics companies or facilitate internships at relevant organizations. This allows

	students to observe AC power converter manufacturing processes, interact with professionals, and gain practical industry experience. By employing these teaching strategies, students can develop a strong foundation in AC power converters, enhance their problem-solving abilities, and acquire the practical skills necessary for designing, analyzing, and implementing AC power conversion systems.

Student Workload (SWL)
الحمل الدراسي للطالب

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	63	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4.2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	62	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	4.13
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	125		

Module Evaluation
تقييم المادة الدراسية

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

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered

Here is a sample weekly delivery plan for an AC power converter module. Please note that the exact schedule may vary depending on the specific curriculum and course duration:

Week 1:

- Introduction to AC power conversion
- AC voltage and current characteristics
- Power factor and power quality considerations

Week 2, 3, 4, 5, and 6:

- AC-DC rectifiers: Half-wave and full-wave rectifiers
- Diode bridge rectifiers
- Controlled rectifiers
- Single and three phase rectifiers

Week 7, 8, and 9:

- DC-AC inverters: Single-phase and three-phase inverters
- Pulse width modulation techniques for inverter control

Week 10:

- Multilevel converters: Diode-clamped and cascaded H-bridge multilevel converters
- Pulse width modulation techniques for multilevel converters

Week 11:

- Resonant converters: Series and parallel resonant converters
- Zero-voltage and zero-current switching techniques

Week 12:

- AC-AC converters: Cycloconverters and matrix converters
- Control strategies for AC-AC converters

Week 13:

- Grid-connected power converters: Grid synchronization and grid integration requirements

	Week 14: • Review and revision • Project presentations and discussions Week 15: * Final Exam: Note: This is a general guideline for a 14-week semester, and the topics can be adjusted based on the curriculum and course requirements. It's important to allocate time for practical exercises, laboratory sessions, assignments, and assessments throughout the module

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
	Here is a sample weekly lab syllabus for an AC power converter module. This plan focuses on hands-on practical exercises and laboratory experiments related to AC power converters: Week 1: Introduction to the lab equipment and safety procedures Familiarization with basic power electronics components (diodes, capacitors, resistors) Measurement techniques (voltage, current, power) and use of laboratory instruments Week 2 and 3: Lab exercise: Half-wave and full-wave rectifier circuits Measurement and analysis of rectifier performance (ripple voltage, output voltage) Week 4 and 5: Lab exercise: Diode and controlled bridge rectifier circuit Measurement and analysis of rectifier performance (ripple voltage, output voltage) Week 6 and 7: Lab exercise: Single-phase half and full bridge inverter design and implementation Measurement and analysis of inverter output waveform and harmonics

	Week 8 and 9: Lab exercise: Three-phase 120 and 180 degree inverter design and implementation Measurement and analysis of three-phase inverter output waveform and harmonics Week 10: Lab exercise: Multilevel converter design and implementation Measurement and analysis of multilevel converter output waveform and harmonics Week 11: Lab exercise: Power quality analysis in AC power converters Measurement and analysis of harmonic content, power factor, and total harmonic distortion (THD) Week 12, and 13: Project work: Matlab simulation to design and implementation of an AC power converter for a specific application Note: This lab syllabus is a general guideline and can be modified based on the available resources, equipment, and time constraints. It is important to provide clear instructions, documentation, and support during the lab sessions to ensure students' understanding and successful completion of the experiments. Week 14 Review

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	**Mohummed Rashid" Power electronics circuits, Devices and application" 4th edition, 2014.**	Yes
Recommended Texts		No
Websites		

APPENDIX:

GRADING SCHEME مخطط الدرجات

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

Note:

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

Ministry of Higher Education and
Scientific Research - Iraq
Northern Technical University
Engineering Technical College/Mosul
Department of Electrical Engineering Techniques

MODULE DESCRIPTOR FORM

نموذج وصف المادة الدراسية

Module Information

معلومات المادة الدراسية

Module Title	**SYNCHRONOUS AND SPECIAL MACHINES**	**Module Delivery**	
Module Type	CORE	✓ **Theory** **Lecture** ✓ **Lab** **Tutorial** ✓ **Practical** ✓ **Seminar**	
Module Code	EET308		
ECTS Credits	6		
SWL (hr/sem)	**150**		
Module Level	3	**Semester of Delivery**	2
Administering Department	**DEPARTMENT OF ELECTRICAL ENGINEERING TECHNIQUES**	**College**	**NORTHERN TECHNICAL UNIVERSITY ENGINEERING TECHNICAL COLLEGE/MOSUL**
Module Leader	Ahmed.J.ali	**e-mail**	ahmed.j.ali@ntu.edu.iq
Module Leader's Acad. Title	Assist.Professor	**Module Leader's Qualification**	Doctor
Module Tutor	None	**e-mail**	None
Peer Reviewer Name	None	**e-mail**	None
Review Committee Approval	14/06/2023	**Version Number**	1.0

Relation With Other Modules

العلاقة مع المواد الدراسية الأخرى

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

Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

Module Objectives أهداف المادة الدراسية	1. Understand the principles of operation of synchronous machines and special machines, including their construction, working principles, and characteristics. 2. Analyze and calculate the performance parameters of synchronous machines, such as power factor, efficiency, voltage regulation, and synchronous reactance. 3. Analyze and calculate the performance parameters of special machines, such as permanent magnet machines, switched reluctance machines, and brushless DC machines. 4. Design and select synchronous machines for specific applications, considering factors such as power requirements, speed control, and load characteristics. 5. Design and select special machines for specific applications, considering factors such as torque-speed requirements, efficiency, and control methods. 6. Evaluate the advantages, limitations, and applications of synchronous machines

	7. special machines analyzing in various industries, such as power generation, renewable energy systems, electric vehicles, and robotics.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Demonstrate a comprehensive understanding of the principles of operation, construction, and characteristics of synchronous machines and special machines. 2. Calculate and analyze the performance parameters of synchronous machines, such as power factor, efficiency, voltage regulation, and synchronous reactance. 3. Calculate and analyze the performance parameters of special machines, such as permanent magnet machines, switched reluctance machines, and brushless DC machines. 4. Design and select synchronous machines for specific applications, considering factors such as power requirements, speed control, and load characteristics. 5. Design and select special machines for specific applications, considering factors such as torque-speed requirements, efficiency, and control methods. 6. Evaluate the advantages, limitations, and applications of synchronous machines and special machines in various industries, such as power generation, renewable energy systems, electric vehicles, and robotics. 7. Apply control methods and techniques for synchronous machines and special machines, including field control, excitation control, and speed control.
Indicative Contents المحتويات الإرشادية	• Basic principles of operation • Types of synchronous machines • Construction and components of synchronous machines • Phasor diagram and equivalent circuit • Synchronous Machine Performance Analysis • Synchronous machine modeling and equations • Calculation of synchronous machine parameters (synchronous reactance, armature reaction, etc.) • Voltage regulation and power factor control • Efficiency and losses in synchronous machines • Synchronous Machine Operation and Control • Field excitation control methods • Voltage control methods (AVR, brushless excitation system, etc.) • Reactive power control and power factor correction • Synchronization and parallel operation of synchronous generators • Applications and advantages of permanent magnet machines • Switched Reluctance Machines • Basics of switched reluctance machines • Construction and working principles of switched reluctance machines • Control techniques for switched reluctance machines • Applications and advantages of brushless DC machines • Special Machine Applications • Synchronous machines in power systems and power generation • Special machines in electric vehicles and hybrid systems • Special machines in renewable energy systems (wind turbines, hydroelectric generators, etc.)

	• Special machines in industrial automation and robotics

Learning and Teaching Strategies
استراتيجيات التعلم والتعليم

Strategies	1. Lectures: Conduct traditional lectures to introduce theoretical concepts, working principles, and mathematical modeling of synchronous and special machines. Use visual aids, such as slides and diagrams, to enhance understanding. 2. Practical Demonstrations: Organize practical sessions where students can observe the operation of synchronous and special machines. This can include laboratory experiments or field visits to industries using these machines. 3. Simulation and Modeling: Utilize software tools and simulations to create virtual environments for students to analyze and simulate the behavior of synchronous and special machines. This helps in understanding complex phenomena and performing virtual experiments. 4. Case Studies: Present real-life case studies of synchronous and special machines in different applications, such as power generation, renewable energy, and industrial automation. Encourage students to analyze and discuss the challenges and solutions encountered in these cases. 5. Conceptual Understanding: Begin by providing a comprehensive overview of special machines, their unique characteristics, and their applications in various industries. Help students develop a solid conceptual understanding of special machines and their significance.

Student Workload (SWL)
الحمل الدراسي للطالب

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	93	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	6.2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	57	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	3.8
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	150		

Module Evaluation
تقييم المادة الدراسية

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

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
1	Introduction
2	Basic construction of synchronous machine.
3	Equivalent circuit of synchronous generator.
4	Parallel operation of synchronous generator.
5	Effect of changing field excitation at constant load.
6	Theory of Synchronous motor.
7	V curves for Synchronous motor.
8	Basic construction Single phase induction motor.
9	Equivalent circuit of Single-phase induction motor.
10	Starting Torque method of Single-phase induction motor.
11	Theory and construction of stepper motor
12	Theory and construction of SRM motor
13	Theory and construction of linear motor
14	Theory and construction of universal motor
15	**Final Examination**
	Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر
1	Lab 1: Determination of regulation of three _phase alternator by direct loading.
2	Lab 2: Three phase alternator open circuit characteristics.
3	Lab 3: Three phase alternator short circuit characteristics.
4	Lab 4: Three Phase alternator Load (resistance load).
5	Lab 5: Three Phase alternator Load (Inductive load).
6	Lab 6: Three Phase alternator Load (capacitive load).
7	Lab 7: Three phase synchronous motor V-curve test.
8	Lab 8: Three phase synchronous motor compensator test.
9	Lab 9: Starting torque method of three phase synchronous motor.
10	Lab 10: Run capacitor starting of single-phase induction motor.
11	Lab 11: Making single phase induction motor self-starting.
12	Lab 12: Reversing of single-phase induction motor.
13	Lab 13: No-load test of single-phase induction motor.
14	Lab 14: Review

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	"ELECTRICAL MACHINERY AND TRANSFORMERS " by BBAG S.GURU , 3th Edition, 2001	Yes
Recommended Texts	"Electric Machinery Fundamentals" by Stephen J. Chapman 2000.	No
Websites	https://books.google.com/books?id=7DvhCgAAQBAJ&dq=principles+of+electric+machines+and+power+electronics&hl=ar&newbks=1&newbks_redir=1&sa=X&ved=2ahUKEwi1tv-N9cP_AhWFIMUKHQtfCw4Q6AF6BAgDEAI	

APPENDIX:

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

Note:

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

Ministry of Higher Education and
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Department of Electrical Engineering Techniques

MODULE DESCRIPTOR FORM

نموذج وصف المادة الدراسية

Module Information

معلومات المادة الدراسية

Module Title	**DIGITAL CONTROLLERS**	**Module Delivery**	
Module Type	CORE	✓ **Theory** **Lecture** ✓ **Lab** **Tutorial** ✓ **Practical** **Seminar**	
Module Code	EET309		
ECTS Credits	6		
SWL (hr/sem)	150		
Module Level	3	**Semester of Delivery**	2
Administering Department	**DEPARTMENT OF ELECTRICAL ENGINEERING TECHNIQUES**	**College**	**NORTHERN TECHNICAL UNIVERSITY ENGINEERING TECHNICAL COLLEGE/MOSUL**
Module Leader	Bashar Abdullah Hamad	**e-mail**	bashar.hamad@ntu.edu.iq
Module Leader's Acad. Title	Lecturer	**Module Leader's Qualification**	Master
Module Tutor	None	**e-mail**	None
Peer Reviewer Name	None	**e-mail**	None
Review Committee Approval	14/06/2023	**Version Number**	1.0

Relation With Other Modules

العلاقة مع المواد الدراسية الأخرى

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

Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

Module Objectives أهداف المادة الدراسية	1. To help the students understand the basic principles of Microcontroller based design and development 2. To help the students design and build functional prototypes for real-world applications 3. To encourage the students to better understand the state-of-the-art interfacing technologies, their potential applications, and their market views. 4. To help the students undertake problem identification, formulation, and selection of an appropriate Microcontroller.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1- Analyze the architecture of microcontrollers. 2- Write an assembly language program for the given problem. 3- Use instructions for different addressing modes. 4- Develop an assembly language program using an assembler.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following: Part A – Microcontrollers Basics. • Microcontrollers Basics, Types of Microcontrollers, Applications of Microcontrollers, System Design Using Microcontroller

	• Microcontroller Architecture, CPU Architecture • Input / Output Ports, Digital Input /Output, Analogue Input / Output, Digital to Analogue conversion (DAC) • Analogue to Digital converter (ADC), Principle of Operation, Digital Ramp ADC • Communication Interfaces, SCI (UART), UART Parameters, USART, Timer, Counter, Output Compare • Pulse Width Modulation (PWM), PWM signal generated by an up-counter, PWM signal generated by an up-down-counter • Introduction to Microcontroller Programming, Assembly Language, Addressing Modes, PC-relative Addressing, and Pseudo-Opcodes [22 hrs] Part B Arduino Microcontroller. • Arduino Microcontroller, Arduino Pins, Arduino Software Sketch Structure, Example: "hello world" program • Variable Definition, Variable types, Integers, Floating, Arithmetic Operators, Programming Example, Relational Operators, • The FOR Loop, Example, The While Loop, Example, IF Statement, Example, Logical Operation, Example, Arduino Functions, The Structure of Function, Calling a Function [10 hrs]

Learning and Teaching Strategies
استراتيجيات التعلم والتعليم

Strategies	1-**Hands-on Experiments:** Engage students in practical experiments to deepen their understanding of the operation, programming, and application of microcontrollers. 2-**Simulation Software:** Simulation Software: Use proteus software for virtual circuit design and programming based on a microcontroller. 3-**Problem-solving Exercises:** Include various problem-solving exercises for programming and the application of microcontroller techniques. 4-**Group Projects:** Assign collaborative projects for programming, and application of microcontrollers. 5-**Real-world Applications:** Discuss practical applications of microcontrollers in different devices and systems. 5-**Interactive Discussions:** Encourage student participation and critical thinking through open-ended questions. 6-**Conceptual Understanding:** Focus on intuitive understanding alongside mathematical analysis. 7-**Assessment Variety:** Use diverse assessment methods to gauge student understanding. 8-**Office Hours and Support:** Offer individualized assistance through office hours or online support.

Student Workload (SWL)
الحمل الدراسي للطالب

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

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

Module Evaluation
تقييم المادة الدراسية

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

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
1,2	**Microcontrollers Basics, Types of Microcontrollers, Applications of Microcontrollers, System Design Using Microcontroller**
3,4	**Microcontrollers Basics, Types of Microcontrollers, Applications of Microcontrollers, System Design Using Microcontroller**
5	**Input / Output Ports, Digital Input /Output, Analogue Input / Output, Digital to Analogue conversion (DAC)**
6,7	**Analogue to Digital converter (ADC), Principle of Operation, Digital Ramp ADC**
8,9	**Communication Interfaces, SCI (UART), UART Parameters, USART, Timer, Counter, Output Compare**
10	**Pulse Width Modulation (PWM), PWM signal generated by an up-counter, PWM signal generated by an up-down-counter**
11	**Introduction to Microcontroller Programming, Assembly Language, Addressing Modes, PC-relative Addressing, Pseudo-Opcodes**
12	**Arduino Microcontroller, Arduino Pins, Arduino Software Sketch Structure, Example: "hello world" program**
13	**Variable Definition, Variable types, Integers, Floating, Arithmetic Operators, Programming Example** **Relational Operators,**
14	**The FOR Loop, Example, The While Loop, Example, IF Statement, Example, Logical Operation, Example, Arduino Functions, The Structure of Function, Calling a Function**
15	**Final Examination**

Delivery Plan (Weekly Lab. Syllabus)
المنهاج الاسبوعي للمختبر

	Material Covered
1	**Lab 1: Arduino and Light-Emitting Diode**
2	**Lab 2: Arduino and Liquid Crystal Display**
3	**Lab 3: Push Button and Light Emitting Diode/Liquid Crystal Display**
4	**Lab 4: Push Button–Digital "LOW"**
5	**Lab 5: Push Button–Digital "HIGH"**
6	**Lab 6: Fire Sensor and Light Emitting Diode/Liquid Crystal Display**

7	**Lab 7: Passive Infrared Sensor and Light Emitting Diode/Liquid Crystal Display.**
8	**Lab 8: Arduino and Analog Devices: Ultrasonic Sensor and Liquid Crystal Display**
9	**Lab 9: Ultrasonic Sensor—Serial Out**
10	**Lab 10: Ultrasonic Sensor—PWM Out**
11	**Lab 11: Temperature Sensor and Liquid Crystal Display**
12	**Lab 12: Temperature Sensor-Analog Out**
13	**Lab 13: Humidity/Temperature Sensor—Serial Out**
14	**Lab 14: Review**

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Mazidi, Muhammad Ali Mazidi Janice Gillispie, and Rolin D. McKinlay. "The 8051 microcontroller and embedded systems using assembly and C". 2016.	Yes
Recommended Texts	Ayala, Kenneth J. "Eighty Fifty-One Microcontroller: Architecture, Programming, and Applications." (1991). "The 8051 Microcontroller Based Embedded Systems", Manish K Patel, McGraw Hill, 2014, ISBN: 978-93-329-0125-4.	No
Websites	Microprocessors And Microcontrollers https://nptel.ac.in/courses/108105102	

APPENDIX:

GRADING SCHEME
مخطط الدرجات

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

Note:

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

Ministry of Higher Education and
Scientific Research - Iraq
Northern Technical University
Engineering Technical College/Mosul
Department of Electrical Engineering Techniques

MODULE DESCRIPTOR FORM

نموذج وصف المادة الدراسية

Module Information

معلومات المادة الدراسية

Module Title	**ENGLISH LANGUAGE (ADVANCED)**		
Module Type	SUPLEMENT	✓ **Theory** **Lecture** **Tutorial** **Seminar**	
Module Code	EET310		
ECTS Credits	3		
SWL (hr/sem)	75		
Module Level	3	**Semester of Delivery**	2
Administering Department	DEPARTMENT OF ELECTRICAL ENGINEERING TECHNIQUES	**College**	NORTHERN TECHNICAL UNIVERSITY ENGINEERING TECHNICAL COLLEGE/MOSUL
Module Leader	Ali N. Hamoodi	**e-mail**	ali_n_hamoodi74@ntu.edu.iq
Module Leader's Acad. Title	Assist.Professor	**Module Leader's Qualification**	Ph.D
Module Tutor	None	**e-mail**	None
Peer Reviewer Name	None	**e-mail**	None
Review Committee Approval	14/06/2023	**Version Number**	1.0

Relation With Other Modules

العلاقة مع المواد الدراسية الأخرى

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

Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

Module Objectives أهداف المادة الدراسية	**The student will acquire English tensed, grammers as well as how to use the vocabulary for forming the sentences, solving the problems and short conversation.**
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Ability to understand and use complex vocabulary and grammar structures 2. Proficiency in reading and comprehending advanced texts 3. Effective communication skills in both written and spoken English 4. Critical thinking and analytical skills for interpreting and evaluating information 5. Cultural awareness and sensitivity when communicating with people from diverse backgrounds 6. Ability to write clear and concise reports, essays, and other professional documents 7. Fluency in academic English for higher education or research purposes 8. Confidence in participating in debates, discussions, and presentations in English 9. Proficiency in using technology to enhance language learning and communication 10. Understanding of the nuances of English language usage in different contexts and situations.

Indicative Contents المحتويات الإرشادية	1. Complex vocabulary and grammar structures 2. Reading and comprehending advanced texts 3. Effective communication skills 4. Critical thinking 5. Cultural awareness 6. Writing clear and concise reports, essays, and professional documents

Learning and Teaching Strategies
استراتيجيات التعلم والتعليم

Strategies	1. Practice reading and analyzing complex texts, such as academic articles and research papers. 2. Expand vocabulary by reading widely and using vocabulary-building tools. 3. Use grammar exercises and resources to improve grammar skills. 4. Engage in critical thinking activities, such as analyzing arguments and evaluating evidence. 5. Learn about different cultures and their communication styles to improve cross-cultural communication. 6. Seek feedback on writing from peers or tutors to improve writing skills. 7. Participate in academic discussions and debates to practice communication skills. 8. Use technology such as language learning apps, online dictionaries, and grammar checkers to support language learning. 9. Pay attention to the context and purpose of language use to understand appropriate language usage. 10. Seek out opportunities for immersion in English-speaking environments, such as studying abroad or participating in language exchange programs.

Student Workload (SWL)
الحمل الدراسي للطالب

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	33	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	2.2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	42	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	2.8
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	75		

Module Evaluation
تقييم المادة الدراسية

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

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered

1	**Unit one : Introduction to the English language.**
2	**Unit two : Survey of English literature.**
3	**Unit three: Tenses.**
4	**Unit four: Grammars.**
5	**Unit Five : Semantics.**
6	**Unit six : English language in the communication.**
7	**Unit seven : Creative writing.**
8	**Unit eight : Creative reading.**
9	**Unit nine : Sentences formation.**
10	**Unit ten : Circuit analysis in English language.**
11	**Unit eleven : Circuit problems in English language.**
12	**Unit twelve : Flowchart formation in English language.**
13	**Unit thirteen : Block diagram formation in English language.**
14	**Unit fourteen : Conversation.**
15	**Final Examination.**

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	1. "The Elements of Style" by William Strunk Jr. and E.B. White 2. "The Oxford English Grammar" by Sidney Greenbaum 3. "The Cambridge Handbook of English Corpus Linguistics" edited by Douglas Biber and Randi Reppen 4. "Advanced Grammar in Use" by Martin Hewings 5. "The Longman Dictionary of Contemporary English" by Pearson Education Limited 6. "The Art of Styling Sentences" by Ann Longknife and K.D. Sullivan 7. "The Cambridge Dictionary of English Grammar" by Pam Peters 8. "English for Academic Purposes: A Handbook for Students and Teachers" by R.R. Jordan 9. "Advanced Vocabulary in Context" by Bernard Seal 10. "Academic Writing: A Handbook for International Students" by Stephen Baile	Yes
Recommended Texts	2. "The Oxford English Grammar" by Sidney Greenbaum	No
Websites	English Language (advanced) https://www.amazon.com/Oxford-English-Grammar-Greenbaum-1996-05-02/dp/B019NDQWGA	

APPENDIX:

GRADING SCHEME

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

Note:

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

Ministry of Higher Education and
Scientific Research - Iraq
Northern Technical University
Engineering Technical College/Mosul
Department of Electrical Engineering Techniques

MODULE DESCRIPTOR FORM
نموذج وصف المادة الدراسية

Module Information
معلومات المادة الدراسية

Module Title	**Communication Systems/ Elective 1**	**Module Delivery**	
Module Type	Elective	✓ **Theory** **Lecture** ✓ **Lab** **Tutorial** ✓ **Practical** ✓ **Seminar**	
Module Code	EET311		
ECTS Credits	5		
SWL (hr/sem)	125		
Module Level	3	**Semester of Delivery**	2
Administering Department	**DEPARTMENT OF ELECTRICAL ENGINEERING TECHNIQUES**	**College**	**NORTHERN TECHNICAL UNIVERSITY ENGINEERING TECHNICAL COLLEGE/MOSUL**
Module Leader	Dhuha Abdulmunem Mohammed	**e-mail**	dhuha.abdulmunem@ntu.edu.iq
Module Leader's Acad. Title	Assist.Teacher	**Module Leader's Qualification**	Master
Module Tutor	None	**e-mail**	None
Peer Reviewer Name	None	**e-mail**	None
Review Committee Approval	14/06/2023	**Version Number**	1.0

Relation With Other Modules
العلاقة مع المواد الدراسية الأخرى

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

Module Aims, Learning Outcomes and Indicative Contents
أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

Module Objectives أهداف المادة الدراسية	1-Understanding and teaching students the principles and foundations of communications engineering, their mathematical relations, and how to deal with them. 2- Enable students to obtain knowledge and understand the laws of electronic physics and theories of complex communications engineering and how to use them in the design of modern communication systems and in the analysis of programs related to communication systems. 3- To make the student understand the methods of digital signal transmission, its processing, methods of its dissemination in different media, the possibility of transferring data and information from one place to another, as well as enabling students to obtain knowledge and understanding of the practical framework in the field of communications. 4-Circuit Simulation and Design: The course may involve introducing students to circuit simulation software. They will learn how to use simulation tools to analyze and design Communication Systems, verify their calculations.

	5-Problem-Solving Skills: An important objective is to develop students' problem-solving skills in the context of Modulation. They will learn how to analyze transmission line using Smith chart, Crank Diagram, formulate appropriate strategies, and apply their knowledge to solve a variety of lossless and loss line problems efficiently. 6- Enabling students to obtain knowledge and understanding of the design of various and advanced communication systems, according to generations of communications. 7- Enabling students to obtain knowledge and understanding to understand electric and magnetic fields and the force resulting from them, work, magnetic induction, charge distribution, capacitors and various insulators, as well as knowing and understanding the active electronic parts in communication systems. 8-Laboratory Skills: The course includes Matlab program laboratory experiments to provide students with practical experience in building, testing, and troubleshooting communication systems.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1-Fundamental Knowledge: Explanation of the topics of the foundations of communication engineering by specialists in the subject, with an emphasis on the use of mathematics as a basis for understanding and learning. 2- Provide them with the skills of solving practical problems related to various Communication systems and computer programs related to communication systems. 3-Circuit Analysis Skills: Students will develop the ability to analyze Communication networks and the processes of sending and receiving information using various techniques such as applying Smith chart, Crank Diagram. They will gain proficiency in solving complex circuit problems and calculating circuit parameters. 4- Communication systems Design and Simulation: Students will be able to design and simulate Communication networks, using appropriate components and considering design constraints. They will learn to use circuit simulation software to verify their designs, analyze circuit performance, and troubleshoot circuit issues. 5-Laboratory Skills: Introduction to Matlab Communication Systems design, students will develop practical skills in building, testing, and troubleshooting Communication networks. 6-Critical Thinking and Analysis: The course will promote critical thinking and analytical skills among students. They will learn to evaluate different modulation circuit solutions, analyze circuit behavior, and make informed decisions based on their understanding of Communication systems. By the end of the course, students will possess a comprehensive knowledge of DC circuits, enabling them to analyze, design, and troubleshoot a wide range of electrical circuits. Enabling students to imagine the electronic circuit components of digital communication systems. Enabling students to think and analyze topics related to solving practical problems.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following: • Part A – Transmission Lines. Constituent parts of an Communication systems (source, load, communication & control), analyzing the Transmission Lines using Smith chart and Crank Diagram then solving Transmissions lines equations. [8 hrs] • Part B Modulation, Demodulation. AM Modulation, Angle Modulation, Noise in AM Systems, Noise in Angle Modulation Systems [32 hrs] • Part C (Noise and Radio transmitters, receivers) Sources of noise, resistor noise, calculation of noise, Noise in AM Systems, Noise in Angle Modulation Systems. Radio transmitters and receivers. [14 hrs] • Revision problem classes [6 hrs]

Learning and Teaching Strategies
استراتيجيات التعلم والتعليم

Strategies	1-**Hands-on Experiments:** Engage students in practical experiments to deepen their

	understanding of circuits. 2-**Simulation Software:** Use circuit simulation software for virtual communication circuit design and analysis. 3-**Problem-solving Exercises:** Include various problem-solving exercises to apply circuit analysis techniques. 4-**Group Projects:** Assign collaborative projects for circuit design and construction. 5-**Real-world Applications:** Discuss practical applications of circuits in different devices and systems. 5-**Interactive Discussions:** Encourage student participation and critical thinking through open-ended questions. 6-**Conceptual Understanding:** Focus on intuitive understanding alongside mathematical analysis. 7-**Assessment Variety:** Use diverse assessment methods to gauge student understanding. 8-**Office Hours and Support:** Offer individualized assistance through office hours or online support.

Student Workload (SWL)
الحمل الدراسي للطالب

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	78	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	5.2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	47	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	3.13
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	125		

Module Evaluation
تقييم المادة الدراسية

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

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
1,2	**Transmission Lines, Transmissions lines equations**
3	**Crank diagram**
4,5	**Smith Chart**
6	**lossless and lossy lines**
7	**Amplitude Modulation, Modulation Index, Spectrum of AM Signal**
8	**Modulators, Demodulators**
9	**Power Calculations in AM Systems, Application of AM Systems**
10	**Angle Modulation, Phase and Frequency Modulation, Phase and Frequency Deviation**
11	**Comparison between AM and FM**
12	**Parameter variation method, indirect method of frequency modulation (Armstrong method), frequency multiplication**

13	**Sources of noise, resistor noise, calculation of noise, Noise in AM Systems, Noise in Angle Modulation Systems**
14	**Radio transmitters, Radio receivers.**
15	**Final Examination**

Delivery Plan (Weekly Lab. Syllabus)
المنهاج الاسبوعي للمختبر

	Material Covered
1	Introduction to Matlab Communication Systems design
2	Function Generation
3	Signal Generation, Sampling, and Reconstruction
4	AM Modulation
5	AM Demodulation
6	FM Modulation
7	FM Demodulation
8	MID-TERM EXAM
9	Phase Modulation
10	Phase Demodulation
11	Noise
12	Sound In MATLAB And Add Noise For Signal
13	Signals Generation and add Noise
14	**A/D Converter**
15	Review

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	**Available in the Library?**
Required Texts	كتاب أساسيات الاتصالات تأليف: سامي محمد طاهر, خليل حسن سيد مرعي, بايزخورشيد.دار الكتب للطباعة والنشر-الموصل 1989.	Yes
Recommended Texts	*B.P. Lathi & Zhi Ding*: "Modern Digital And Analog Communication Systems". Oxford University Press. 2018.	No
Websites	Communication Systems https://www.tutorialspoint.com/principles_of_communication/principles_of_communication_introduction.htm	

APPENDIX:

GRADING SCHEME
مخطط الدرجات

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

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

Note:

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

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MODULE DESCRIPTOR FORM

نموذج وصف المادة الدراسية

Module Information

معلومات المادة الدراسية

Module Title	**Digital Signal Processing/ Elective 1**	**Module Delivery**	
Module Type	Elective	✓ **Theory** **Lecture** ✓ **Lab** **Tutorial** ✓ **Practical** ✓ **Seminar**	
Module Code	EET311		
ECTS Credits	5		
SWL (hr/sem)	78		
Module Level	3	**Semester of Delivery**	2
Administering Department	DEPARTMENT OF ELECTRICAL ENGINEERING TECHNIQUES	**College**	NORTHERN TECHNICAL UNIVERSITY ENGINEERING TECHNICAL COLLEGE/MOSUL
Module Leader	Dhuha Abdulmunem Mohammed	**e-mail**	dhuha.abdulmunem@ntu.edu.iq
Module Leader's Acad. Title	Assist.Teacher	**Module Leader's Qualification**	Master
Module Tutor	None	**e-mail**	None
Peer Reviewer Name	None	**e-mail**	None
Review Committee Approval	14/06/2023	**Version Number**	1.0

Relation With Other Modules

العلاقة مع المواد الدراسية الأخرى

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

Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

Module Objectives أهداف المادة الدراسية	1-an ability to apply knowledge of mathematics, science and engineering. 2-an ability to design and conduct experiments, as well as to analyze and interpret data. 3- an ability to design a system, component, or process to meet desired needs. 4an ability to identify, formulate, and solve engineering problems 5-Circuit Simulation and Design: The course may involve introducing students to circuit simulation software. They will learn how to use simulation tools to analyze and design Digital Signal Processing Concept, verify their calculations. 6-Problem-Solving Skills: An important objective is to develop students' problem-solving skills in the context of Discrete Time signal. They will learn how to find formulate appropriate strategies, and apply their knowledge to solve a variety of filters problems efficiently. 7- Enabling students to obtain knowledge and understanding of the design of various and advanced Digital Signal Processing, according to generations of signals.

	8-Laboratory Skills: The course includes Matlab program laboratory experiments to provide students with practical experience in building, testing, and troubleshooting Digital Signal Processing.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1-Fundamental Knowledge: Explanation of the topics of the foundations of communication engineering by specialists in the subject, with an emphasis on the use of mathematics as a basis for understanding and learning. Provide them with the skills of solving practical problems related to various Digital Signal Processing and computer programs related to Digital Signal Processing. 2-Circuit Analysis Skills: Students will develop the ability to analyze signals and the processes of sending and receiving information using various techniques such as applying Convolution and autocorrelation. They will gain proficiency in solving complex signals problems and calculating parameters. 3- Digital Signal Processing Design and Simulation: Students will be able to design and simulate Communication networks, using appropriate components and considering design constraints. They will learn to use signals simulation software to verify their designs, analyze circuit performance, and troubleshoot signal issues. 4-Laboratory Skills: Introduction to Matlab, students will develop practical skills in building, testing, and troubleshooting Digital Signal Processing. 5-Critical Thinking and Analysis: The course will promote critical thinking and analytical skills among students. They will learn to evaluate different signal solutions, analyze signal behavior, and make informed decisions based on their understanding of Digital Signal Processing. By the end of the course, provide students with a comprehensive treatment of the important issues in design, implementation and applications of digital signal processing concepts and algorithms.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following: • Part A – Discrete Time Signals. This part include review of Discrete Signals, Discrete Time Fourier transform (DTFT), Discrete Fourier Series (DFS) and Discrete Fourier Transform (DFT) [32 hrs] • Part B Finite impulse response (FIR) and infinite impulse response (IIR) This part include Finite impulse response (FIR) and infinite impulse response (IIR)and IIR filter design using analog prototype [14 hrs] • Part C Digital filter realization This part include Direct-Form I Realization, Direct-Form I I Realization, Cascade (Series) Realization and Parallel Realization [8hrs] • Revision problem classes [6 hrs]

Learning and Teaching Strategies
استراتيجيات التعلم والتعليم

Strategies	1-**Hands-on Experiments:** Engage students in practical experiments to deepen their understanding of circuits. 2-**Simulation Software:** Use circuit simulation software for virtual communication circuit design and analysis. 3-**Problem-solving Exercises:** Include various problem-solving exercises to apply circuit analysis techniques. 4-**Group Projects:** Assign collaborative projects for circuit design and construction. 5-**Real-world Applications:** Discuss practical applications of circuits in different devices and systems. 5-**Interactive Discussions:** Encourage student participation and critical thinking through open-ended questions.

	6-**Conceptual Understanding:** Focus on intuitive understanding alongside mathematical analysis. 7-**Assessment Variety:** Use diverse assessment methods to gauge student understanding. 8-**Office Hours and Support:** Offer individualized assistance through office hours or online support.

Student Workload (SWL)
الحمل الدراسي للطالب

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	78	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	5. 2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	54	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	3.6
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	125		

Module Evaluation
تقييم المادة الدراسية

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

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
1	**Review of Discrete Signals**
2,3	**Discrete Time Fourier transform (DTFT)**
4	**Discrete Fourier Series (DFS)**
5,6	**Discrete Fourier Transform (DFT)**
7,8	**Fast Fourier Transform (FFT)**
9,10	**FIR**
11,12	**IIR**
13,14	**Digital filter realization**
15	**Final Examination**

Delivery Plan (Weekly Lab. Syllabus)
المنهاج الاسبوعي للمختبر

	Material Covered
1	A/D Converter and D/A Converter
2	Generation Of Discrete Signals
3	Operations On Sequences
4	Convolution Of Two Sequences
5	Autocorrelation
6	Frequency Response Of A Given Discrete System

7	Impulse Response Of A Given Discrete System
8	MID-TERM EXAM
9	Generation Of Discrete Fourier Transform (DFT) Of A Sequence
10	Generation Of Inverse Discrete Fourier Transform (IDFT) Of A Sequence
11	Finding The FFT Of Different Signals
12	Implementation Of LP & HP FIR Filter For A Given Sequence (Using Windowing Techniques)
13	Implementation Of IIR LP Filter For A Given Sequence
14	Implementation Of IIR HP Filter For A Given Sequence
15	Review

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	**TEXT BOOK 1:** "DIGITAL SIGNAL PROCESSING" by John J. Proakis, and Dimitris G. Manolakis .	Yes
Recommended Texts	**Text book 2:** " APPLIED DIGITAL SIGNAL PROCESSING THEORY AND PRACTICE" Dimitris g. Manolakis, and Vinay k. Ingle, 2011. **Text book 3:** " SIGNALS AND SYSTEMS WITH MATLAB" BY WON Y. YANG · TAE G. CHANG · IK H. SONGM, YONG S. CHO · JUN HEO · WON G. JEON · JEONG W. LEE · JAE K. KIM, 2009.	No
Websites	Digital Signal Processing https://www.tutorialspoint.com/digital_signal_processing/index.htm	

APPENDIX:

GRADING SCHEME
مخطط الدرجات

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

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

Ministry of Higher Education and

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Northern Technical University

Engineering Technical College/Mosul

Department of Electrical Engineering Techniques

Module Descriptor Form

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**DC Generators**			**Module Delivery**	
Module Type	**Core**			☒**Theory** ☐**lecture** ☒**Lab** ☐**Tutorial** ☒ **Practical** ☒ **Seminar**	
Module Code	**EET200**				
ECTS Credits	**5**				
SWL (hr/sem)	**125**				
Module Level	2		**Semester of Delivery**	1	
Administering Department	Electrical Engineering Techniques		**College**	Northern Technical University Engineering Technical College/Mosul	
Module Leader	Mohammed Ahmed Ibrahim		**e-mail**	Mohammed.a.ibrahim1981@ntu.edu.iq	
Module Leader's Acad. Title	Assist Professor		**Module Leader's Qualification**	Ph.D.	
Module Tutor	Name (if available)		**e-mail**	E-mail	
Peer Reviewer Name	Name		**e-mail**	E-mail	
Scientific Committee Approval Date	01/06/2023		**Version Number**	1.0	

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

Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	The objectives of DC generators include: 1. To convert mechanical energy into electrical energy: DC generators are designed to convert mechanical energy, such as that produced by a turbine or an engine, into electrical energy. 2. To maintain a constant voltage output: DC generators are designed to maintain a constant voltage output, regardless of changes in the load or speed of the generator. 3. To provide a reliable source of power: DC generators are designed to provide a reliable source of power for a variety of applications, including industrial, commercial, and residential use. 4. To be efficient: DC generators are designed to be efficient, converting as much of the mechanical energy into electrical energy as possible. 5. To be durable and long-lasting: DC generators are designed to be durable and long-lasting, with a lifespan of several decades or more. 6. To be easy to maintain: DC generators are designed to be easy to maintain, with simple maintenance procedures and readily available replacement parts. 7. To meet safety standards: DC generators are designed to meet safety standards for electrical equipment, including grounding and insulation requirements.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	Upon completion of this module, learners should be able to: 1. Explain the basic operating principles of DC generators, including the role of the commutator and brushes. 2. Describe the different types of DC generators, including shunt, series, and compound generators. 3. Calculate the output voltage and current of a DC generator, based on its design parameters and load characteristics. 4. Analyze the performance characteristics of a DC generator, including its efficiency, voltage regulation, and speed control. 5. Identify common maintenance procedures for DC generators, including cleaning, lubrication, and inspection of electrical components. 6. Evaluate the safety risks associated with working with DC generators, and

	implement appropriate safety measures to prevent accidents or injuries. 7. Apply knowledge of DC generators to solve practical problems in industrial, commercial, or residential settings.
Indicative Contents المحتويات الإرشادية	1. Introduction to DC generators: basic principles, construction, and working. 2. Types of DC generators: shunt, series, and compound generators. 3. Voltage and current output calculations of DC generators. 4. Performance characteristics of DC generators: efficiency, voltage regulation, and speed control. 5. Maintenance procedures for DC generators: cleaning, lubrication, and inspection of electrical components. 6. Safety measures for working with DC generators: risk assessment, protective gear, and emergency procedures. 7. Applications of DC generators in various industries: power generation, transportation, and telecommunications.

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

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	78	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	5.2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	47	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	3.13

Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**125**

Module Evaluation

تقييم المادة الدراسية

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

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	**Basic construction of electrical machines**
Week 2	**Construction of D.C. generator**
Week 3	**General features of D.C. armature windings**
Week 4, 5, 6	**Types of D.C. armature windings**
Week 7	**Function of commutator and brushes, e.m.f equation of D.C. generator**
Week 8	**Armature reaction and commutation**
Week 9, 10	**Types of D.C. generators**
Week 11, 12	**Losses in D.C. machines**
Week 13	**D.C. generator characteristics**

Week 14	**Parallel operation of D.C. generators**
Week 15	**Final Examination**
Week 16	**Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	**Prime Mover**
Week 2	**Separately Excited DC Generator**
Week 3	**Series DC Generator**
Week 4	**Shunt DC Generator**
Week 5	**Compound DC Generator**
Week 6	**Separately Excited DC Generator of Open Circuit Characteristics (O.C.C Test)**
Week 7	**Shunt Excited DC Generator of Open Circuit Characteristic**
	Prime Mover
	Separately Excited DC Generator
	Series DC Generator
	Shunt DC Generator
	Compound DC Generator
	Separately Excited DC Generator of Open Circuit Characteristics (O.C.C Test)
	Shunt Excited DC Generator of Open Circuit Characteristic
	Prime Mover

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	ELECTRICAL TECHNOLOGY B.L. THERAJA A.K. THERAJA	Yes

Recommended Texts	Electric Machinery and Transformers Bhag S. Guru	No
Websites	https://www.amazon.com/Electric-Machinery-Transformers-Electrical-Engineering/dp/0195138902	

Grading Scheme

مخطط الدرجات

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

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

Ministry of Higher Education and
Scientific Research - Iraq
Northern Technical University
Engineering Technical College/Mosul
Department of Electrical Engineering Techniques

MODULE DESCRIPTOR FORM

نموذج وصف المادة الدراسية

Module Information

معلومات المادة الدراسية

Module Title	**ELECTRONIC ESSENTIALS**	**Module Delivery**	
Module Type	CORE	✓ **Theory** **Lecture** ✓ **Lab** **Tutorial** ✓ **Practical** ✓ **Seminar**	
Module Code	EET201		
ECTS Credits	5		
SWL (hr/sem)	125		
Module Level	2	**Semester of Delivery**	1
Administering Department	**DEPARTMENT OF ELECTRICAL ENGINEERING TECHNIQUES**	**College**	**NORTHERN TECHNICAL UNIVERSITY ENGINEERING TECHNICAL COLLEGE/MOSUL**
Module Leader	Ahmed Ghazi Abdullah	**e-mail**	ahmed.g.alhealy@ntu.edu.iq
Module Leader's Acad. Title	Lecturer	**Module Leader's Qualification**	Master
Module Tutor	None	**e-mail**	None
Peer Reviewer Name	None	**e-mail**	None
Review Committee Approval	14/06/2023	**Version Number**	1.0

Relation With Other Modules

العلاقة مع المواد الدراسية الأخرى

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

Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

Module Objectives أهداف المادة الدراسية	1- Understanding the Basics: The primary objective of the Electronic Basic course is to provide students with a solid foundation in the basic principles of how electronic circuits work and how they are made from semiconductor materials. 2-Analyzing Circuit Components: Students will understand how the p-n junction is formed and how it is manufactured, as well as understanding and analyze the electronic circuits in which the diode is included, like as rectifier circuit , clipping circuit ,clamper circuit, and others. the student will also learn the principle of operation of BJT transistor 3-Circuit Laws and Theorems: Students will become familiar with important laws and theorems governing the diode and transistor applications circuits. They will gain proficiency in applying these principles to solve complex circuit problems. 4-Circuit Simulation and Design: The course may involve introducing students to circuit simulation software. They will learn how to use simulation tools to analyze and design electronic circuits, verify their calculations, and gain practical insights into circuit behavior. 5-Problem-Solving Skills: An important objective is to develop students' problem-solving skills in the context of electronic circuits. They will learn how to analyze circuit diagrams, formulate appropriate strategies, and apply their knowledge to solve a variety of circuit problems efficiently.

	6-Laboratory Skills: The course includes hands-on laboratory experiments to provide students with practical experience in building, testing, and troubleshooting electronic circuits.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1-Fundamental Knowledge: Students will acquire a solid understanding of the fundamental concepts and principles of electronic circuits that's contain diode and transistor. 2-Circuit Analysis Skills: Students will develop the ability to analyze electronic circuits such as rectifier circuit , clipping circuit , clamper circuits, Zener circuits , and amplifier circuits 3-Circuit Design and Simulation: Students will be able to design and simulate electronic circuits, using appropriate components and considering design constraints. They will learn to use circuit simulation software to verify their designs, analyze circuit performance, and troubleshoot circuit issues. 4-Laboratory Skills: Through hands-on laboratory experiments, students will develop practical skills in building, testing, and troubleshooting electronic circuits. They will become proficient in using measuring instruments, interpreting experimental data, and ensuring safety precautions while working with electrical circuits. 5-Critical Thinking and Analysis: The course will promote critical thinking and analytical skills among students. They will learn to evaluate different circuit solutions, analyze circuit behavior, and make informed decisions based on their understanding of electronic circuits. By the end of the course, students will possess a comprehensive knowledge of electronic circuits, enabling them to analyze, design, and troubleshoot a wide range of electrical circuits. They will be prepared for further studies in electrical engineering or related fields and equipped with skills that can be applied in professional practice.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following: • Part A – semiconductor device. The composition of the atoms and materials used in the manufacture of semiconductor materials and the specifications of each material. In addition to that, how to form the p-type semiconductor and the N-type semiconductor, and how to manufacture the diode .[12 hrs] • Part B - diode circuits. Rectifier circuits, clipping circuits, clamper circuits. Multiplier circuits. [16 hrs] • Part C - zener and transistor circuit zener regulator circuits, the LED circuit, the Photo diode circuit. And bjt circuits. [26 hrs] • Revision problem classes [6 hrs]

Learning and Teaching Strategies
استراتيجيات التعلم والتعليم

Strategies	1-**Hands-on Experiments:** Engage students in practical experiments to deepen their understanding of circuits. 2-**Simulation Software:** Use circuit simulation software for virtual circuit design and analysis. 3-**Problem-solving Exercises:** Include various problem-solving exercises to apply circuit analysis techniques. 4-**Group Projects:** Assign collaborative projects for circuit design and construction. 5-**Real-world Applications:** Discuss practical applications of circuits in different devices and systems. 5-**Interactive Discussions:** Encourage student participation and critical thinking through open-ended questions. 6-**Conceptual Understanding:** Focus on intuitive understanding alongside mathematical analysis. 7-**Assessment Variety:** Use diverse assessment methods to gauge student understanding.

	8-**Office Hours and Support:** Offer individualized assistance through office hours or online support.

Student Workload (SWL)
الحمل الدراسي للطالب

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	47	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	5.2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	78	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	3.13
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل			

Module Evaluation
تقييم المادة الدراسية

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

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
1	Semiconductors materials
2	PN junction, introduction and characteristics
3	Diode applications , clipping circuit
4,5	Clamper circuit , voltage doubler ,voltage tripler and voltage quadreplier
6,7	half wave rectifier and full wave bridge rectifier
8	Filter circuits for half wave and full wave
9	Center-tapped rectifier
10, 11	Special purpose diodes (Zener diode , photo diode, LED)
12	Introduction to Bipolar Junction Transistors (BJT)
13	BJT circuit analysis and characteristics
14	Field effect transistor FET (Introduction and characterstics)
15	Final Examination

Delivery Plan (Weekly Lab. Syllabus)
المنهاج الاسبوعي للمختبر

	Material Covered
1	LAB 1: DIODE CHARACTERISTICS
2	LAB 2: CLIPPING CIRCUITS
3	LAB 3: CLAMPER CIRCUITS
4	LAB 4: VOLTAGE DOUBLER
5	LAB 5: VOLTAGE TRIPLER AND QUADREPIER
6	LAB 6: RECTIFIER CIRCUITS , HALF WAVE RECTIFIER , FULL WAVE BRIDGE RECTIFIER

7	LAB 7: HALF WAVE RECTIFIER AND FULL WAVE BRIDGE RECTIFIER WITH FILTER
8	LAB 8: CENTER TAPED RECTIFIER
9	LAB 9: ZENER DIODE CHARACTERISTICS
10	LAB 10: ZENER DIODE REGULATION AND CLIPPING
11	LAB 11: BIPOLAR JUNCTION TRANSISTORS (BJT) CHARACTERISTICS
12	LAB 12: BJT SMALL SIGNAL AMPLIFIER
13	LAB 13: FIELD EFFECT TRANSISTOR FET CHARACTERISTICS
14	LAB 14: REVIEW

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Thomas L. Floyd "Electronic Devices Conventional Current Version"	Yes
Recommended Texts	Robert L. Boylestad , Louis Nashelsky "Electronic Devices and Circuit Theory"	No
Websites		

APPENDIX:

GRADING SCHEME
مخطط الدرجات

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

Note:

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MODULE DESCRIPTOR FORM

نموذج وصف المادة الدراسية

Module Information
معلومات المادة الدراسية

Module Title	**ELECTRICAL CIRCUITS ANALYSIS**	**Module Delivery**	
Module Type	CORE	✓ **Theory** **Lecture** ✓ **Lab** **Tutorial** ✓ **Practical** ✓ **Seminar**	
Module Code	EET202		
ECTS Credits	5		
SWL (hr/sem)	125		
Module Level	2	**Semester of Delivery**	1
Administering Department	**DEPARTMENT OF ELECTRICAL ENGINEERING TECHNIQUES**	**College**	**NORTHERN TECHNICAL UNIVERSITY ENGINEERING TECHNICAL COLLEGE/MOSUL**
Module Leader	Sanabel muhson mohammed ali	**e-mail**	Sanabel.m.mohammed@ntu.edu.iq
Module Leader's Acad. Title	ASS. Prof	**Module Leader's Qualification**	master
Module Tutor	None	**e-mail**	None
Peer Reviewer Name	None	**e-mail**	None
Review Committee Approval	13/06/2023	**Version Number**	1.0

Relation With Other Modules
العلاقة مع المواد الدراسية الأخرى

Prerequisite module	**ADVANCED ELECTRICAL CIRCUITS ANALYSIS**	**Semester**	2
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents
أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

Module Objectives أهداف المادة الدراسية	**Students will learn the principle of** 1-transient AC and DC circuit 2- design the circuits which used to power electronics, motors, 3-and delay circuits applications. 4-Learn how to calculate and analyze voltage and current phasors in AC circuits, including their amplitudes, phases, and frequency relationships. 5-Explore the behavior and characteristics of AC circuit elements, such as resistors, capacitors, and inductors, and understand their roles in AC circuit analysis. 6-Investigate the concept of impedance in AC circuits and its relationship to resistance, reactance, and frequency. 7-Study the principles of AC power and power factor, including real power, reactive power, apparent power, and power factor correction.

	8- Gain a comprehensive understanding of three-phase AC systems, including the generation, transmission, and distribution of power in three-phase circuits.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. 1-Knowledge Acquisition: Students will acquire a comprehensive understanding of the fundamental concepts and principles of Comparison of AC and DC transient circuit 2-Circuit Design and Analysis: Students will gain the ability to design and analyze Resonance A.c and Dc circuit heir knowledge of impedance, power factor, and component characteristics. They will learn to calculate voltage and current magnitudes, phase differences, and power relationships in AC circuits. 3- Quality Factor, Bandwidth and Half-Power Frequency in resonance circuits Students will be able to construct and interpret band width to visualize and analyze the behavior of voltages and currents in resonance circuits. 4-Three-Phase Systems: Students will acquire understanding of three-phase AC systems, including balanced and unbalanced configurations. Laboratory Skills: Students will develop practical skills in using circuit simulation software and laboratory equipment to design, analyze, and verify the performance of TRANSIENT AC and DC circuits.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following: • Part A – Definitions, units, and transient applications General concept of UNITS and some application of transient system [3 hrs] • Part B – Unit step forcing function General concept of applying UNIT step function for the electrical circuit [4 hrs] • Part C Transient analysis in DC circuit. Source free and step response RL and RC circuits in DC system. Comoplet response of a series and a parallel RLC circuits in DC system. [10 hrs] • Part D Single - phase of AC Circuits. AC in resistive circuits, current and voltage in inductive circuits, current and voltage in capacitive circuits. Concept of complex impedance and admittance, AC series and parallel circuits. RL, RC and RLC circuit analysis and phasor representation. [14 hrs] • Part E resonance of AC Circuits Resonance in A.c Series and parallel RLC Circuit ,Quality Factor (Q), Bandwidth and Half-Power Frequency in resonance circuits,Tank circuit and dynamic impedance in RLC circuit [14 hrs]

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	1-Conceptual Understanding: Explain transient AC and DC circuits, introduce the concept of complete response of RL ,RC circuit, and highlight the significance of RLC series and parallel circuit and phases in AC circuits. 2-Mathematical Foundations: Provide a solid mathematical foundation for transient DC and AC circuits. Teach students the use of phasor notation to analyze AC

	circuits. 3-Problem-Solving Skills: Dedicate adequate time to problem-solving exercises and examples. 4-Laboratory Experiments: Incorporate laboratory experiments to reinforce theoretical concepts. Allow students to build and analyze AC circuits using oscilloscopes, function generators, and AC power sources. 5-Simulation Tools: Introduce simulation MATLAB software tools that allow students to simulate circuits and observe their behavior. 6-Review and Assessment: Regularly review key concepts and provide formative assessments to gauge students' understanding. Offer constructive feedback on their performance to help them identify areas for improvement.

Student Workload (SWL)
الحمل الدراسي للطالب

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	63	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4.2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	62	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	4.133
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	125		

Module Evaluation
تقييم المادة الدراسية

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

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
Week 1	**Definitions, units, and transient applications**
Week 2	**Unit step forcing function.**
Week 3,4	**Source free series and parallel RLC circuits in DC system.**
Week 5	**Comoplet response of a series and a parallel RLC circuits in DC system.**

Week 6	Resonance in A.c Series and parallel RLC Circuit
Week 7	**Quality Factor (Q), Bandwidth and Half-Power Frequency in resonance circuits**
Week 8	**Tank circuit and** dynamic impedance **in RLC circuit**
Week 9,10	**Sinusoids, phasors diagram for circuit elements.**
Week 11	Balanced three-phase circuits: (wye –wye, delta-delta, connections).
Week 12	Balanced three-phase circuits: (wye-delta, delta-wye connections).
Week 13,14	**Unbalanced three phase system**
Week 15	**Final Examination**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: Introduction to Matlab Model Power circuit design
Week 2	Lab 2: unit step forcing function
Week 3	Lab 3: Simulation of free source series RLC (over ,critical, under damped)
Week 4	Lab 4: Simulation of free source parallel RLC (over ,critical, under damped)
Week 5	Lab 5: Simulation of complete response of series and parallel RLC (over, critical, under damped)
Week 6	Lab 6: simulation of the Resonance in series RLC Circuit
Week 7	Lab 7: simulation of the Resonance in parallel RLC Circuit
Week 8	Lab 8: simulation of the sinusoidal steady state system
Week 9	Lab 9: simulation The sinusoidal transient analysis
Week 10	Lab 10:simulation of three phase wye to wye connection
Week 11	Lab 11:simulation of three phase delta to delta connection
Week 12	Lab 12:simulation of three phase wye to delta connection
Week 13	Lab 13:simulation of three phase unbalanced wye to wye connection
Week 14	Lab 14: Review

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Charles K. Alexander, Matthew N.O. Sdiku Fundamentals of Electrical Engineering, 4th Edition, 2009	Yes
Recommended Texts	Tony R. Kuphaldt, Lessons In Electric Circuits, Volume II - AC 5th edition, 2002	No
Websites	AC circuits https://byjus.com/physics/ac-circuit/	

APPENDIX:

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

Note:

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

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Department of Electrical engineering Techniques

MODULE DESCRIPTOR FORM
نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية				
Module Title	SENSORS		**Module Delivery**	
Module Type	CORE		☒ **Theory** **Lecture** ☒ **Lab** ☐ **Tutorial** ☒ **Practical** ☐ **Seminar**	
Module Code	EET203			
ECTS Credits	4			
SWL (hr/sem)	100			
Module Level	2		**Semester of Delivery**	1
Administering Department	Department Of Electrical Engineering Techniques		**College**	Northern Technical University Engineering Technical College / Mosul
Module Leader	Ahmed Saad Yahya		**e-mail**	ahmed.saad.yahya@ntu.edu.iq
Module Leader's Acad. Title	Assist Lecturer		**Module Leader's Qualification**	M.Sc.
Module Tutor	None		**e-mail**	None
Peer Reviewer Name	None		**e-mail**	None
Scientific Committee Approval Date	14/06/2023		**Version Number**	1.0

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

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	1. To realize the operation principle of several sensors and recognize the key issues in selecting the right instrument. 2. To be acquainted with several types of actuators. 3. To understand modern signal transmission techniques and relevant standards. 4. To become aware of the sampling theorem, ADC and DAC.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Knowledge of sensors, including types and operation principle. 2. Get to know the principle of Position sensors, their types and uses. 3. Get to know the principle of Temperature Sensors, their types and uses. 4. Apply acquired knowledge to the Acceleration & vibration sensors. 5. Get to know the principle of pressure Sensors. their types and uses. 6. Apply acquired knowledge to the speed sensors. 7. Specify and select appropriate sensors for a wide range of systems and applications. 8. Knowledge of actuators, including types and operation principle. 9. Apply acquired knowledge to the Transmitters. 10. Knowledge of ADC & DAC.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. Sensors [16 hrs.] • Position measurement o Limit switch o Proximity sensors o Potentiometer o LVDT o Encoders • Stress & strain measurement o Strain gauge • Temperature measurement o Metal strip o RTD o Thermistor o Thermocouple • Acceleration & vibration measurements • Pressure measurement • Speed measurement Actuators [4 hrs.] • Dc motor • Servo motor • Stepper motor • Solenoid

	Transmitters [4 hrs.] • Current transmitter 0-20 / 4-20 • Voltage transmitter 0-10 Analog & Digital interfaces [4 hrs.] • Sampling theorem • ADC • DAC

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The main strategy that will be adopted in delivering this module is interactive learning through the visualization via flow charts, graphic and pictures that helps students to receive the information in a simpler, clear and systematic way. Also, depending on group work by dividing student into small groups of mixed abilities. By doing so, those who have more knowledge of the subject can share their knowledge and help their peers understand the topic better. Adapt Inquiry-Based learning to Encouraging learners to ask a lot of questions that does not only motivate students to think more practically but also helps them to become independent learners.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	63	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4.2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	37	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	2.46
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**100**		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	4	10% (10)	2,5,9,12	LO # 1,3, 4, 6 and 7
	Assignments	9	10% (10)	1-12	LO # 1,3, 4, 6 and 10

	Projects / Lab.	10	10% (10)	Continuous	All
	Report	8	10% (10)	2-10	LO #5, #8 and #10
Summative assessment	**Midterm Exam**	2hr	10% (10)	8	LO #1 - #8
	Final Exam	3hr	50% (50)	15	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Introduction to the sensors (general principles of sensors).
Week 2	Sensors: Limit switch, Proximity sensors.
Week 3	Sensors: Potentiometer, LVDT.
Week 4	Sensors: Encoders, Strain gauge.
Week 5	Sensors: Metal strip, RTD.
Week 6	Sensors: Thermistor, Thermocouple.
Week 7	Sensors: Acceleration sensors.
Week 8	Sensors: vibration sensors.
Week 9	Sensors: Pressure sensors, Speed sensors.
Week 10	Actuators: Dc motor, Servo motor.
Week 11	Actuators: Stepper motor, Solenoid.
Week 12	Transmitters: Current transmitter 4-20 mA & Voltage transmitter 0-10 v
Week 13	Analog & Digital interfaces (Sampling theorem).
Week 14	ADC (Analogue to Digital Converter).
Week 15	DAC (Digital to Analogue Converter).
Week 16	Preparatory week before the final Exam**.**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: Limit switch, Proximity sensors.

Week 2	Lab 2: Potentiometer.
Week 3	Lab 3: Encoders
Week 4	Lab 4: RTD (Resistance Temperature Detector)
Week 5	Lab 5: Thermocouple.
Week 6	Lab 6: Pressure sensor
Week 7	Lab 7: Tachometer
Week 8	Lab 8: Servo motor
Week 9	Lab 9: Stepper motor
Week 10	Lab 10: Solenoid
Week 11	Lab 11: Current transmitter & Voltage transmitter.
Week 12	Lab 12: ADC (Analogue to Digital Converter).
Week 13	Lab 13: DAC (Digital to Analogue Converter).
Week 14	Lab 14: Review

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	**Available in the Library?**
Required Texts	Introduction to Instrumentation and Measurements, Third Edition, Robert B. Northrop.	No
Recommended Texts	Measurement, Instrumentation and Sensors Handbook.	No
Websites	https://www.udemy.com/course/sensors-sensor-fundamentals/	

Grading Scheme
مخطط الدرجات

Group	**Grade**	التقدير	**Marks %**	**Definition**
Success Group (50 - 100)	**A** - Excellent	امتياز	90 - 100	Outstanding Performance
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Fail Group (0 – 49)	**FX** – Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded

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

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

Ministry of Higher Education and
Scientific Research - Iraq
Northern Technical University
Engineering Technical College/Mosul
Department of Electrical Engineering Techniques

MODULE DESCRIPTOR FORM
نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	APPLIED MATHEMATICS			**Module Delivery**	
Module Type	BASIC			☒ **Theory** **Lecture** ☐ **Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	EET204				
ECTS Credits	5				
SWL (hr/sem)	125				
Module Level	2		**Semester of Delivery**	1	
Administering Department	Electrical Engineering Techniques		**College**	Technical Engineering/Mosul	
Module Leader	**Rasha Abd Alnafaa Mohammed**		**e-mail**	Rashana8479@ntu.edu.iq	
Module Leader's Acad. Title	Lecturer		**Module Leader's Qualification**	MSC	
Module Tutor	Name (if available)		**e-mail**	E-mail	
Peer Reviewer Name	Name		**e-mail**	E-mail	
Scientific Committee Approval Date	14/06/2023		**Version Number**	1	

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

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	The applied mathematics curriculum aims to teach the student the principle of mathematics, lows , solve the equations and the electrical circuit.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	Important: Write at least 6 Learning Outcomes, better to be equal to the number of study weeks. 1. Definition of differential equation, degree and order 2. Solve five type of ordinary differential equations 3. Laplace transform lows, properities 4. Inverse laplace transform 5. Second order differential equation, Homogenous, Non Homogenous 6. Operations on the vector 7. Types of coordinatees
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. Part A - Fundamentals of applied mathematics Introduction to basic concepts, functions, ends, vectors, trigonometric and inverse functions, derivatives, applications of derivatives, integration, methods of integration, matrices Part B – Solve equations Fundamental definitions,Solve five type of ordinary differential equations ,Laplace transform lows, properities,Inverse laplace transform,Second order differential equation, Homogenous, Non Homogenous, vectors, coordinatees.
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 .

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	63	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4.2
Unstructured SWL (h/sem)	62	**Unstructured SWL (h/w)**	4.1

الحمل الدراسي غير المنتظم للطالب خلال الفصل		الحمل الدراسي غير المنتظم للطالب أسبوعيا	
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**125**		

Module Evaluation
تقييم المادة الدراسية

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

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
Week 1	Vectors type ,Addition ,subtraction ,scaller multiplication ,length of vector, Distance formla , compute angle between vectors and convert coordinates
Week 2	Introduction about the ordinary of differential equations ,Types, The order and degree of differential equations ,Separable of ordinary of differential equations
Week 3	Homogenous and Non Homogenous of ordinary of differential equations
Week 4,5	Exact and not exact of ordinary of differential equations
Week 6	Linear ordinary of differential equations
Week 7	Bernoullis Equations
Week 8	Solve equation about differential equation
Week 8	Second order differential equation, Homogenous, Non Homogenous
Week 9,10	Introduction to laplace transform,Lows, Properties of laplace transform

Week 11	Examples about Properties of laplace transform
Week 12	Inverse laplace transform,Lows ,examples
Week 13	Solve equation of inverse laplace using Simple real poles, Repeated real poles, Un repeated complex poles
Week 14	Final Examination

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	CALCULAS thomas	Yes
Recommended Texts	كتاب التفاضل والتكامل د.رمضان محمد, د.احمدعبدالعالي	No
Websites		

Grading Scheme
مخطط الدرجات

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

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

Ministry of Higher Education and
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Engineering Technical College/Mosul
Department of Electrical engineering Techniques

MODULE DESCRIPTOR FORM
نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	COMPUTER APPLICATION			**Module Delivery**	
Module Type	**SUPLEMENT**			☒ **Theory** **Lecture** ☒ **Lab** ☐ **Tutorial** ☒ **Practical** ☒ **Seminar**	
Module Code	EET205				
ECTS Credits	4				
SWL (hr/sem)	100				
Module Level	2		**Semester of Delivery**	1	
Administering Department	Electrical Engineering Techniques		**College**	Technical engineering /Mosul	
Module Leader	**Rasha Abd Alnafaa Mohammed**		**e-mail**	Rashana8479@ntu.edu.iq	
Module Leader's Acad. Title	Lecturer		**Module Leader's Qualification**	MSC	
Module Tutor	Name (if available)		**e-mail**	E-mail	
Peer Reviewer Name	Name		**e-mail**	E-mail	
Scientific Committee Approval Date	14/06/2023		**Version Number**	1	

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

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	Students will learn the principle use of computer program, solve the function and equation using command of matlab program.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	Important: Write at least 6 Learning Outcomes, better to be equal to the number of study weeks. 1. Operations solution on matrices 2. Operations solution on vectors 3. Solve Linear equation by direct method 4. Solve Linear equation by least square 5. Solve Non linear equation 6. Solve 2nd order Linear Differential equation 7. Mathematical process (integral, differential and limits) for functions 8. To learn draw 2D,3D 9. Properities and increase accuracy of draw 10. Find the roots by Newton Raphson method 11. Solve equation by Laplace with MATLAB 12. Solve equation by Laplace inverse with MATLAB
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. Part A - Fundamentals of the computer hardware and software Definition of computerand its parts, method of operation, types of memories, type of system and programs used (word, excel, powerpoint). Part B – Solve function and equation by matlab program Introduction for MATLAB Program,Mathematical process on matrices ,Mathematical process on vectors,Linear equation by direct method,Linear equation by least square Non linear equation,2nd order Linear Differential equation ,Mathematical process (integral, differential and limits) for functions Draw 2D,3D,Properities and increase accuracy of draw,Newton Raphson method for roots,Invisible instructions ,Laplace with MATLAB,Laplace inverse with MATLAB.
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 .

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	63	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4.2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	37	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	2.46
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**100**		

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

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Introduction for MATLAB Program
Week 2	Mathematical process on matrices
Week 3	Mathematical process on vectors
Week 4	Linear equation by direct method
Week 5	Linear equation by least square
Week 6	Non linear equation
Week 7	2nd order Linear Differential equation

Week 8	Mathematical process (integral, differential and limits) for functions
Week 9	Draw 2D,3D
Week 10	Properities and increase accuracy of draw
Week 11	Newton Raphson method for roots
Week 12	Invisible instructions
Week 13	Laplace with MATLAB
Week 14	Laplace inverse with MATLAB
Week 15	**Final exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Introduction for MATLAB Program
Week 2	Mathematical process on matrices
Week 3	Mathematical process on vectors
Week 4	Linear equation by direct method
Week 5	Linear equation by least square
Week 6	Non linear equation
Week 7	2nd order Linear Differential equation
Week 8	Mathematical process (integral, differential and limits) for functions
Week 9	Draw 2D,3D, Properities and increase accuracy of draw
Week 10	Newton Raphson method for roots
Week 11	Invisible instructions
Week 12	Laplace with MATLAB
Week 13	Laplace inverse with MATLAB
Week 14	Review
Week 15	

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	كتاب الماتلاب للمهندسين	No

	عدنان شاهين	
Recommended Texts	كتاب الماتلاب عصام سرحان	No
Websites		

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

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

Ministry of Higher Education and
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Northern Technical University
Engineering Technical College/Mosul
Department of Electrical Engineering Techniques

MODULE DESCRIPTOR FORM
نموذج وصف المادة الدراسية

Module Information
معلومات المادة الدراسية

Module Title	ENGLISH LANGUAGE (INTERMEDIATE)	**Module Delivery**	
Module Type	SUPLEMENT	✓ **Theory** ✓ **Lecture** **Lab** **Tutorial** **Practical** **Seminar**	
Module Code	EET211		
ECTS Credits	2		
SWL (hr/sem)	50		

Module Level	2	**Semester of Delivery**	1
Administering Department	DEPARTMENT OF ELECTRICAL ENGINEERING TECHNIQUES	**College**	NORTHERN TECHNICAL UNIVERSITY ENGINEERING TECHNICAL COLLEGE/MOSUL
Module Leader	Mohammed Yahya	**e-mail**	mohammed.yahya@ntu.edu.iq
Module Leader's Acad. Title	Professor	**Module Leader's Qualification**	PhD
Module Tutor	None	**e-mail**	None
Peer Reviewer Name	None	**e-mail**	None
Review Committee Approval	14/06/2023	**Version Number**	1.0

Relation With Other Modules
العلاقة مع المواد الدراسية الأخرى

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

Module Aims, Learning Outcomes and Indicative Contents
أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

Module Objectives أهداف المادة الدراسية	The aim of the module on English Language is to develop students' proficiency and confidence in using the English language for effective communication. The module aims to enhance students' language skills, including reading, writing, listening, and speaking, as well as their understanding of English grammar, vocabulary, and usage. The module also aims to foster intercultural competence and awareness of sociolinguistic variations in English. Learning Outcomes: 1- Demonstrate proficiency in English language skills, including reading, writing, listening, and speaking. 2- Apply appropriate grammar, vocabulary, and usage in English language communication. 3- Analyze and comprehend a variety of written and spoken texts in English.

	4- Produce coherent and well-structured written texts in English, demonstrating effective writing skills. 5- Engage in meaningful oral communication in English, demonstrating fluency, clarity, and effective presentation skills. 6- Develop intercultural competence and an understanding of sociolinguistic variations in English language use. Indicative Contents: English Language Skills Development: Development of reading skills, including comprehension and analysis of various text types. Enhancement of writing skills, including grammar, vocabulary, and coherent text production. Improvement of listening skills, including understanding spoken English in different contexts. Development of speaking skills, including fluency, pronunciation, and presentation techniques. English Grammar and Vocabulary: Review and application of grammatical structures and rules in written and spoken English. Expansion of vocabulary through the study of word formation, collocations, and idiomatic expressions. Reading Comprehension and Analysis: Practice in reading and understanding different types of texts, such as articles, essays, and literature. Analysis of texts for main ideas, supporting details, and implicit meanings. Writing Skills: Instruction and practice in various writing genres, such as essays, reports, letters, and creative writing. Emphasis on coherent paragraph and essay organization, thesis development, and effective sentence structures. Oral Communication and Speaking Skills: Practice in engaging in conversations, discussions, and presentations in English. Development of fluency, clarity, and effective communication strategies in spoken English. Intercultural Competence and Sociolinguistic Variations: Exploration of cultural aspects and intercultural communication in English-speaking contexts. Awareness of sociolinguistic variations, such as regional accents, dialects, and pragmatic conventions
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1- Demonstrate proficiency in reading, writing, listening, and speaking skills in English. 2- Apply accurate grammar, vocabulary, and language conventions in written and spoken English. 3- Comprehend and analyze a variety of written and spoken texts in English, including different genres and registers. 4- Produce well-structured and coherent written texts in English, demonstrating effective writing skills. 5- Engage in effective oral communication in English, demonstrating fluency, clarity, and appropriate presentation skills. 6- Exhibit intercultural competence and an understanding of sociolinguistic variations in English language use.

	7- These learning outcomes are designed to enhance students' overall English language proficiency and enable them to effectively communicate in various contexts. They cover key language skills, including reading, writing, listening, and speaking, as well as the ability to apply grammar and vocabulary accurately. Students will also develop critical reading and analytical skills to comprehend and interpret different types of texts. Additionally, the learning outcomes emphasize the production of well-structured written texts and effective oral communication, while fostering intercultural competence and an appreciation of sociolinguistic variations in English language use.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following: • Unit one : Introduction to the English language. • Unit two : Getting to know you • Unit three: The way we live • Unit four: It all went wrong • Unit Five : Let's go shopping. • Unit six : What do you want to do? • Unit seven : Tell me What's it like? • Unit eight : Famous couples • Unit nine : Do's and don'ts • Unit ten : Going places • Unit eleven : Scared to death • Unit twelve : Things that changed the world • Unit thirteen : Dreams and reality

Learning and Teaching Strategies
استراتيجيات التعلم والتعليم

Strategies	1-**Hands-on Experiments:** Engage students in practical experiments to deepen their understanding of circuits. 2-**Simulation Software:** Use circuit simulation software for virtual circuit design and analysis. 3-**Problem-solving Exercises:** Include various problem-solving exercises to apply circuit analysis techniques. 4-**Group Projects:** Assign collaborative projects for circuit design and construction. 5-**Real-world Applications:** Discuss practical applications of circuits in different devices and systems. 5-**Interactive Discussions:** Encourage student participation and critical thinking through open-ended questions. 6-**Conceptual Understanding:** Focus on intuitive understanding alongside mathematical analysis. 7-**Assessment Variety:** Use diverse assessment methods to gauge student understanding. 8-**Office Hours and Support:** Offer individualized assistance through office hours or online support.

Student Workload (SWL)
الحمل الدراسي للطالب

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	33	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	2.2

Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	17	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	1.13
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	50		

Module Evaluation
تقييم المادة الدراسية

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

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
1	Unit one : Introduction to the English language.
2	Unit two : Getting to know you
3	Unit three: The way we live
4	Unit four: It all went wrong
5	Unit Five : Let's go shopping.
6	Unit six : What do you want to do?
7	Unit seven : Tell me What's it like?
8	Unit eight : Famous couples
9	Unit nine : Do's and don'ts
10	Unit ten : Going places
11	Unit eleven : Scared to death
12	Unit twelve : Things that changed the world
13	Unit thirteen : Dreams and reality
14	Unit fourteen : Earning a living
15	Final Examination.

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	English learning new headway English course	Yes
Recommended Texts	English learning new headway English course	No
Websites	English learning new headway English course	

APPENDIX:

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

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

Ministry of Higher Education and

Scientific Research - Iraq

Northern Technical University

Engineering Technical College/Mosul

Department of Electrical Engineering Techniques

Module Descriptor Form

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**DC Motors**		**Module Delivery**		
Module Type	**Core**		☒**Theory** **Lecture** ☒**Lab** **Tutorial** ☒**Practical** ☒**Seminar**		
Module Code	**EET207**				
ECTS Credits	**6**				
SWL (hr/sem)	**150**				
Module Level	2		**Semester of Delivery**	2	
Administering Department	Electrical Engineering Techniques		**College**	Northern Technical University Engineering Technical College/Mosul	
Module Leader	Mohammed Ahmed Ibrahim		**e-mail**	Mohammed.a.ibrahim1981@ntu.edu.iq	
Module Leader's Acad. Title	Assist Professor		**Module Leader's Qualification**	MASTER	
Module Tutor	Name (if available)		**e-mail**	E-mail	
Peer Reviewer Name	Name		**e-mail**	E-mail	
Scientific Committee Approval Date	01/06/2023		**Version Number**	1.0	

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

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	1. Understand the basic principles, construction, and working of DC motors. 2. Identify the different types of DC motors, including brushed and brushless motors, and their applications. 3. Calculate the torque and speed of DC motors using various equations and formulas. 4. Analyze the performance characteristics of DC motors, including efficiency, power factor, and speed control. 5. Develop an understanding of maintenance procedures for DC motors, including cleaning, lubrication, and inspection of electrical components. 6. Implement safety measures for working with DC motors, including risk assessment, protective gear, and emergency procedures. 7. Explore the various applications of DC motors in different industries, such as industrial automation, robotics, and electric vehicles.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Understand the basic principles, construction, and working of DC motors. 2. Identify the different types of DC motors, including brushed and brushless motors, and their applications. 3. Calculate the torque and speed of DC motors using various equations and formulas. 4. Analyze the performance characteristics of DC motors, including efficiency, power factor, and speed control. 5. Develop an understanding of maintenance procedures for DC motors, including cleaning, lubrication, and inspection of electrical components. 6. Implement safety measures for working with DC motors, including risk assessment, protective gear, and emergency procedures. 7. Explore the various applications of DC motors in different industries, such as industrial automation, robotics, and electric vehicles.
Indicative Contents المحتويات الإرشادية	1. Introduction to DC motors and their basic principles 2. Construction of DC motors, including stator, rotor, commutator, and brushes 3. Working of DC motors, including the Lorentz force and electromagnetic induction 4. Types of DC motors, including brushed and brushless motors, and their applications 5. Torque and speed calculations for DC motors using various equations and formulas 6. Performance characteristics of DC motors, including efficiency, power factor, and speed control 7. Maintenance procedures for DC motors, including cleaning, lubrication, and inspection of electrical components 8. Safety measures for working with DC motors, including risk assessment, protective gear, and emergency procedures 9. Applications of DC motors in different industries, such as industrial automation, robotics, and electric vehicles 10. Future developments in DC motor technology and their potential impact on various industries.

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

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	78	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	5.2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	72	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	4.8
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**150**		

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

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	**DC motor, principle of dc motors torque develops in motor**
Week 2	**reverse direction of rotation – back e.m.f. equivalent**
Week 3, 4	**Circuit – calculation of torque – torque characteristics – speed characteristics**
Week 5, 6, 7	**Type of dc motor and their characteristics.**
Week 8,9	**Speed control of D.C. motor**
Week 10	**Losses in dc motor and generators swine brush test.**
Week 11	**Electric braking of D.C. motor**
Week 12	**Necessity of D.C. motor starter**
Week 13	**Testing of D.C. machines**
Week 14	**Losses in dc motor and generators swine brush test.**
Week 14	**Final Examination**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	**Shunt Motor No Load Test**
Week 2	**Shunt Motor Characteristic**
Week 3	**Shunt Motor No Load Test**
Week 4	**Speed control of D.C shunt motor using Flux and Rheostatic control**
Week 5	**Speed Control of DC Shunt Motor Using Variable Supply Voltage**
Week 6	**Speed Control of DC series Motor Using Variable Supply Voltage**
Week 7	**DC Shunt Motor Load test**
Week 8	**DC Motor Load test**
Week 9	**Speed control for D.C motor, (Uncontrolled)**
Week 10	**Speed Control of DC Motor (Controlled Rectifiers)**
Week 11	**Load test of DC series motor and find the curves**
Week 12, 13	**Load test on DC cumulatively compounded motor**
Week 14	**Review**

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	ELECTRICAL TECHNOLOGY B.L. THERAJA A.K. THERAJA	Yes
Recommended Texts	Electric Machinery and Transformers Bhag S. Guru	No
Websites		

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

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

Ministry of Higher Education and
Scientific Research - Iraq
Northern Technical University
Engineering Technical College/Mosul
Department of Electrical Engineering Techniques

MODULE DESCRIPTOR FORM

نموذج وصف المادة الدراسية

Module Information

معلومات المادة الدراسية

Module Title	**ELECTRONIC CIRCUITS**	**Module Delivery**	
Module Type	CORE	✓ **Theory** **Lecture** ✓ **Lab** **Tutorial** ✓ **Practical** ✓ **Seminar**	
Module Code	EET208		
ECTS Credits	5		
SWL (hr/sem)	125		
Module Level	2	**Semester of Delivery**	2
Administering Department	DEPARTMENT OF ELECTRICAL ENGINEERING TECHNIQUES	**College**	NORTHERN TECHNICAL UNIVERSITY ENGINEERING TECHNICAL COLLEGE/MOSUL
Module Leader	Ahmed Ghazi Abdullah	**e-mail**	ahmed.g.alhealy@ntu.edu.iq
Module Leader's Acad. Title	Lecturer	**Module Leader's Qualification**	Master
Module Tutor	None	**e-mail**	None
Peer Reviewer Name	None	**e-mail**	None
Review Committee Approval	14/06/2023	**Version Number**	1.0

Relation With Other Modules

العلاقة مع المواد الدراسية الأخرى

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

Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

Module Objectives أهداف المادة الدراسية	1- Understanding the Basics: The primary objective of the Electronic Basic course is to provide students with a solid foundation in the basic principles BJT , FET transistor and thyristor 2-Analyzing Circuit Components: Students will understand how transistors, and thyristors are formed, as well as understanding and analyzing the electronic circuits in which the transistors and thyrestors are included, like as biasing circuit, comparator circuits , amplifier circuits. 3-Circuit Laws and Theorems: Students will become familiar with important laws and theorems governing the transistor applications circuits. They will gain proficiency in applying these principles to solve complex circuit problems. 4-Circuit Simulation and Design: The course may involve introducing students to circuit simulation software. They will learn how to use simulation tools to analyze and design the electronic circuits, verify their calculations, and gain practical insights into circuit behavior. 5-Problem-Solving Skills: An important objective is to develop students' problem-solving skills in the context of electronic circuits. They will learn how to analyze circuit diagrams, formulate appropriate strategies, and apply their knowledge to solve a variety of circuit problems efficiently.

	6-Laboratory Skills: The course includes hands-on laboratory experiments to provide students with practical experience in building, testing, and troubleshooting electronic circuits.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1-Fundamental Knowledge: Students will acquire a solid understanding of the fundamental concepts and principles of electronic circuits that's contain thyristor and transistor. 2-Circuit Analysis Skills: Students will develop the ability to analyze electronic circuits such as biasing circuits , comparator circuits , amplifier circuits 3-Circuit Design and Simulation: Students will be able to design and simulate electronic circuits, using appropriate components and considering design constraints. They will learn to use circuit simulation software to verify their designs, analyze circuit performance, and troubleshoot circuit issues. 4-Laboratory Skills: Through hands-on laboratory experiments, students will develop practical skills in building, testing, and troubleshooting electronic circuits. They will become proficient in using measuring instruments, interpreting experimental data, and ensuring safety precautions while working with electrical circuits. 5-Critical Thinking and Analysis: The course will promote critical thinking and analytical skills among students. They will learn to evaluate different circuit solutions, analyze circuit behavior, and make informed decisions based on their understanding of electronic circuits. By the end of the course, students will possess a comprehensive knowledge of electronic circuits, enabling them to analyze, design, and troubleshoot a wide range of electrical circuits. They will be prepared for further studies in electrical engineering or related fields and equipped with skills that can be applied in professional practice.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following: • Part A – transistor biasing. DC biasing of BJT transistor and Q-point, Voltage-devider Bias , Emitter Bias, Base Bias, Emitter-Feedback Bias, Collector-Feedback Bias. [16 hrs] • Part B - amplifier circuits. Transistor as an amplifier, The Common-Emitter Amplifier, The Common-Collector Amplifier The Common-Base Amplifier Power Amplifier. [18 hrs] • Part C - Thyristor and Other semiconductor devices (Diac, Triac , SCR) Thyritor characteristic, the SCR circuit, the Triac circuit. And Diac circuit. [20 hrs] • Revision problem classes [6 hrs]

Learning and Teaching Strategies
استراتيجيات التعلم والتعليم

Strategies	1-**Hands-on Experiments:** Engage students in practical experiments to deepen their understanding of circuits. 2-**Simulation Software:** Use circuit simulation software for virtual circuit design and analysis. 3-**Problem-solving Exercises:** Include various problem-solving exercises to apply circuit analysis techniques. 4-**Group Projects:** Assign collaborative projects for circuit design and construction. 5-**Real-world Applications:** Discuss practical applications of circuits in different devices and systems. 5-**Interactive Discussions:** Encourage student participation and critical thinking through open-ended questions. 6-**Conceptual Understanding:** Focus on intuitive understanding alongside mathematical analysis. 7-**Assessment Variety:** Use diverse assessment methods to gauge student understanding. 8-**Office Hours and Support:** Offer individualized assistance through office hours or

	online support.

Student Workload (SWL)
الحمل الدراسي للطالب

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

Module Evaluation
تقييم المادة الدراسية

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

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
1	DC biasing of BJT transistor and Q-point
2	Voltage-devider Bias , Emitter Bias
3	Base Bias
4	Emitter-Feedback Bias
5	Collector-Feedback Bias
6	Transistor as an amplifier , Operation Amplifier
7	The Common-Emitter Amplifier
8	The Common-Collector Amplifier
9	The Common-Base Amplifier
10	Power Amplifier
11	Thyristor
12,13	Other semiconductor devices (Diac, Triac , SCR)
14	SCR applications
15	Final examination

Delivery Plan (Weekly Lab. Syllabus)
المنهاج الاسبوعي للمختبر

	Material Covered
1	LAB 1: FET CHARACTERISTCS
2	LAB 2: SMALL SIGNAL AMPLIFIER
3	LAB 3: TRANSISTOR VOLTAGE-DEVIDER BIASING
4	LAB 4: TRANSISTOR EMITTER BIASING
5	LAB 5: TRANSISTOR BASE BIASING

6	**LAB 6: TRANSISTOR EMITTER-FEEDBACK BIASING**
7	**LAB 7: TRANSISTOR COLLECTOR-FEEDBACK BIASING**
8	**LAB 8: THE COMMON EMITTER AMPLIFIER**
9	**LAB 9: THE COMMON-COLLECTOR AMPLIFIER**
10	**LAB 10: THE COMMON-BASE AMPLIFIER**
11	**LAB 11: THYRISTOR AND SCR CHARACTERISTICS**
12, 13	**LAB 12,13: APPLYING MULTISIM PROGRAM TO USE IT IN ELECTRONIC EXPERIMENTS**
14	**LAB 14: REVIEW**

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Thomas L. Floyd "Electronic Devices Conventional Current Version"	Yes
Recommended Texts	Robert L. Boylestad , Louis Nashelsky "Electronic Devices and Circuit Theory"	No
Websites		

APPENDIX:

GRADING SCHEME
مخطط الدرجات

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

Note:

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

Ministry of Higher Education and
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Department of Electrical Engineering Techniques

MODULE DESCRIPTOR FORM

نموذج وصف المادة الدراسية

Module Information
معلومات المادة الدراسية

Module Title	**ADVANCED ELECTRICAL CIRCUITS ANALYSIS**	**Module Delivery**	
Module Type	CORE	✓ **Theory** **Lecture** ✓ **Lab** **Tutorial** ✓ **Practical** ✓ **Seminar**	
Module Code	EET209		
ECTS Credits	6		
SWL (hr/sem)	150		

Module Level	2	**Semester of Delivery**	2
Administering Department	**DEPARTMENT OF ELECTRICAL ENGINEERING TECHNIQUES**	**College**	**NORTHERN TECHNICAL UNIVERSITY ENGINEERING TECHNICAL COLLEGE/MOSUL**
Module Leader	Sanabel muhson mohammed ali	**e-mail**	Sanabel.m.mohammed@ntu.edu.iq
Module Leader's Acad. Title	ASS. Prof	**Module Leader's Qualification**	master
Module Tutor	None	**e-mail**	None
Peer Reviewer Name	None	**e-mail**	None
Review Committee Approval	13/06/2023	**Version Number**	1.0

Relation With Other Modules
العلاقة مع المواد الدراسية الأخرى

Prerequisite module	**ELECTRICAL CIRCUITS ANALYSIS**	**Semester**	2
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents
أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

Module Objectives أهداف المادة الدراسية	**Students will learn the principle of ;** 1. **Write circuit first order and second order equations for coupled system** 2. **Analyze circuits containing ideal transformers** 3. **Derive two port parameter descriptions for circuits.**
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1-Knowledge Acquisition: Students will acquire a comprehensive understanding of the fundamental concepts and principles of **Write circuit first order and second order equations** circuit 2-Circuit Design and Analysis: Students will gain the ability to design and analyze Resonance A.c and Dc circuit heir knowledge of impedance, power factor, and

	component characteristics. They will learn to calculate voltage and current magnitudes, phase differences, and power relationships in AC circuits. 3-Analyze circuits containing ideal transformers(Laplas transformation and Fourier transformation) 4-Hybird Systems: Students will acquire understanding of hybrid tow port net work systems, including balanced and unbalanced configurations. Laboratory Skills: Students will develop practical skills in using circuit simulation software and laboratory equipment to design, analyze, and verify the performance of different circuits.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following: ● Part A – Application of laplace transform to circuit analysis. Solve the second order differential equation using laplas transformation and Application of Laplace transform to circuit analysis. [6 hrs] ● Part B – Frequency selective circuits Design the passive and active filter select the correct frequency for design [4 hrs] ● Part C Transient analysis in DC circuit. Source free and step response RL and RC circuits in DC system. Comoplet response of a series and a parallel RLC circuits in DC system. [10 hrs] ● Part D Sinusoidal frequency analysis. AC in resistive circuits, current and voltage in inductive circuits, current and voltage in capacitive circuits. Concept of complex impedance and admittance, AC series and parallel circuits. RL, RC and RLC circuit analysis and phasor representation. [14 hrs] ● Part E Two-port networks and Hybrid parameter Two-port networks: (impedance, admittance, transmissions parameters, relationships between parameters, interconnection between networks). [14 hrs]

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	1-Conceptual Understanding: Explain transient AC and DC circuits, introduce the concept of complete response of RLC circuit, and highlight the significance of RLC series and parallel circuit and phases in AC circuits. 2-Mathematical Foundations: Provide a solid mathematical foundation for transient DC and AC circuits. Teach students the use of LAPLAS Transformation to analyze circuits. 3-Problem-Solving Skills: Dedicate adequate time to problem-solving exercises and examples. 5-Simulation Tools: Introduce simulation MATLAB software tools that allow students to simulate circuits and observe their behavior. 6-Review and Assessment: Regularly review key concepts and provide formative assessments to gauge students' understanding. Offer constructive feedback on their performance to help them identify areas for improvement.

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

Module Evaluation
تقييم المادة الدراسية

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

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
Week 1	Sinusoidal steady- state analysis (Kirchhoff's laws, Mesh analysis, Nodal analysis, Superposition's theorem, Thevenin's theorem, Norton's theorem, source transformations).
Week 2	Balanced three-phase circuits: (wye –wye, delta-delta, connections).
Week 3,4	Balanced three-phase circuits: (wye-delta, delta-wye connections).
Week 5	Unbalanced three phase system
Week 6,7	Frequency selective circuits: • Passive filters • Active filters
Week 8	Advanced circuit analysis using Laplace transform.
Week 9,10	Application of Laplace transform to circuit analysis.
Week 11,12	Two-port networks: (impedance, admittance, transmissions parameters, relationships between parameters, interconnection between networks).

Week 11	Hybrid parameter of two port(H-parameters), Inverse hybrid parameters
Week 12	Final Examination

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: simulation of the sinusoidal steady state system
Week 2	Lab 2: simulation The sinusoidal transient analysis
Week 3	Lab 3:simulation of three phase star to star connection
Week 4	Lab 4: simulation of three phase delta to delta connection
Week 5	Lab 5: simulation of three phase star to delta connection
Week 6	Lab 6: simulation of three phase delta to star connection
Week 7	Lab 7: simulation of Unbalanced three phase system in different phase voltage
Week 8	Lab 8: simulation of Unbalanced three phase system in different phase frequency
Week 9	Lab 9: design passive filter in MATLAB program
Week 10	Lab 10: design active filter in MATLAB program
Week 11,12	Lab 11: design Two-port networks impedance in MATLAB program
Week 13	Lab 12: design hybrid of Two-port networks in MATLAB program
Week 14	Lab 14: Review

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Charles K. Alexander, Matthew N.O. Sdiku Fundamentals of Electrical Engineering, 4th Edition, 2009	Yes
Recommended Texts	Tony R. Kuphaldt, Lessons In Electric Circuits, Volume II - AC 5th edition, 2002	No
Websites	AC circuits https://byjus.com/physics/ac-circuit/	

APPENDIX:

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

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

Note:

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

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Engineering Technical College/Mosul
Department of Electrical engineering Techniques

MODULE DESCRIPTOR FORM
نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	INSTRUMENTS AND MEASUREMENTS			**Module Delivery**	
Module Type	CORE			☒ **Theory** **Lecture** ☒ **Lab** ☐ **Tutorial** ☒ **Practical** ☒ **Seminar**	
Module Code	EET210				
ECTS Credits	5				
SWL (hr/sem)	125				
Module Level	2		**Semester of Delivery**	2	
Administering Department	Electrical Engineering Techniques		**College**	Technical Engineering college /Mosul	
Module Leader	Waseem Khalid Ibrahim		**e-mail**	Waseem_kh82@ntu.edu.iq	
Module Leader's Acad. Title	Assistant lecturer		**Module Leader's Qualification**	MSC	
Module Tutor	Name (if available)		**e-mail**	E-mail	
Peer Reviewer Name	Name		**e-mail**	E-mail	
Scientific Committee Approval Date	10/06/2023		**Version Number**	1	

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

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	1. This course deals with define Measurement. 2. Knowledge of measurement errors, their types, their effect on measurements, and how to reduce their effect on measurements. 3. Introduce the Units and standard SI system. 4. Knowledge the Classification of Instruments. 5. Various Measurements, method for determining resistance, inductance and capacitance. 6. Know the system measurement. 7. High voltage measurements and testing.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	Important: Write at least 6 Learning Outcomes, better to be equal to the number of study weeks. 1. Develop the knowledge of theoretical and mathematical principles of electrical measuring instruments. 2. Have knowledge and critical understanding of the well-established principles underpinning measurement. 3. Have knowledge and critical understanding of the well-established principles of measurement and instrument design. 4. Have an understanding of measurement's errors. 5. Understand the role of various factors in calibration. 6. Choose the proper type and specification of measuring procedure and measuring instruments for different plication. 7. Have an understanding of Statistical analysis. 8. Understand the working of various potentiometers, instruments for measurement of R, L and C. 9. Understand the high voltage measurements principles and method of works.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. <u>Part A - Fundamentals of Electronic Measurements and Instrumentation</u> D.C circuits, Current and voltage definitions, circuit elements, Combining resistive elements in series and parallel Ohm's law. Resistive networks, voltage and current sources, Thevenin equivalent circuits, current and voltage division, Capacitance and inductance RL, RC and RLC circuits <u>Part B - Measurements</u> Fundamental definitions, Measurements units, error of Measurements, Statistical

	analysis, D.c. measurement instrument. Ohmmeter as measurement instrument, Alternating - current indicating instruments, Electrodynamometer and application. Bridges, applications of D.c. Bridges, applications of A.c Bridges. Oscilloscope. High voltage measurement and its applications in electrical engineering techniques.
Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Type something like: The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials and by considering types of simple experiments involving some sampling activities that are interesting to the students.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	78	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	5.2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	47	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	3.1
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**125**		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	4	10% (10)	4,10	LO #1#4, #5#9
	Assignments	8	10% (10)	3,12	LO #3, #8
	Projects / Lab.	7	10% (10)	Continuous	All
	Report	9	10% (10)	All	All
Summative assessment	**Midterm Exam**	1hr	20% (20)	7	LO #1 - #7
	Final Exam	3hr	50% (50)	16	All

Total assessment	100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Measurements and error.
Week 2	Statistical analysis.
Week 3	Units and standard SI system.
Week 4	Analogue instruments.
Week 5	D.c Ammeter. D.c Voltmeter.
Week 6	Series Type ohmmeter.
Week 7	Electrodynamic meters – wattmeters
Week 8	The cathode ray oscilloscope.
Week 9	D.C. Bridges & their applications.
Week 10	A.C. Bridges & their applications.
Week 11	Measurements of frequency, power angle, and power factor.
Week 12	D.C. High voltage measurements.
Week 13	A.C. High voltage measurements.
Weeks 14 , 15	Measurement's system.
Week 16	Preparatory week before the final Exam

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	INTRODUCTION TO LAB EQUIPMENT.
Week 2	AMMETER DESIGN.
Week 3	VOLTMETER DESIGN.
Week 4	LOADING EFFECT ON VOLTMETER.
Week 5	OHMMETER DESIGN.

Week 6	MEASUREMENT OF RESISTANCE USING WHEATSTONE BRIDGE.
Week 7	INDUCTANCE COMPARISON BRIDGE.
Week 8	CAPACITANCE COMPARISON BRIDGE.
Week 9	MAXWEEL BRIDGE.
Week 10	HAY BRIDGE.
Week 11	SCHERING BRIDGE.
Week 12	WIEN BRIDGE.
Week 13	OSCILLOSCOPE AND MEASUREMENT OF FREQUENCY.
Week 14	OSCILLOSCOPE AND MEASUREMENT OF PHASE ANGLE.
Week 15	Review

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Electronic instrumentation and measurement techniques, William David Cooper,	Yes
Recommended Texts	Electronic Instrumentation and Measurements, Third Edition, David A. Bell	No
Websites	https://www.abebooks.co.uk/book-search/title/electronic-instrumentation-and-measurements/	

Grading Scheme
مخطط الدرجات

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

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

Ministry of Higher Education and Scientific Research - Iraq
Northern Technical University
Engineering Technical College/Mosul
Department of Electrical engineering Techniques

MODULE DESCRIPTOR FORM
نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	ENGINEERING ANALYSIS			**Module Delivery**	
Module Type	BASIC			☒ **Theory** **Lecture** **Lab** ☒ **Tutorial** ☐ **Practical** ☒ **Seminar**	
Module Code	EET211				
ECTS Credits	5				
SWL (hr/sem)	125				
Module Level	2		**Semester of Delivery**	2	
Administering Department	ELECTRICAL ENGINEERING TECHNIQUES		**College**	NORTHERN TECHNICAL UNIVERSITY ENGINEERING TECHNICAL COLLEGE/MOSUL	
Module Leader	Laith Akram Mohammed		**e-mail**	laith.akram@ntu.edu.iq	
Module Leader's Acad. Title	Assist. prof		**Module Leader's Qualification**	PhD	
Module Tutor	Name (if available)		**e-mail**	E-mail	
Peer Reviewer Name	Name		**e-mail**	E-mail	
Scientific Committee Approval Date	14/06/2023		**Version Number**	1	

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

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	To help students to understand the engineering analysis transformations in complex frequencies domains, in order to solve complicated mathematical and electrical circuits.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	The specific learning outcomes of a module on Engineering Analysis may vary depending on the institution and the specific curriculum. However, here are some common learning outcomes that can be expected from such a module: 1. Understanding of Mathematical Concepts: Develop a strong understanding of fundamental mathematical concepts and their applications in engineering analysis, including calculus, linear algebra, differential equations, and numerical methods. 2. Problem Solving Skills: Develop the ability to apply mathematical techniques and engineering principles to solve complex problems in various areas of engineering, such as mechanics, thermodynamics, fluid dynamics, electrical circuits, and structural analysis. 3. Analytical Thinking: Enhance analytical thinking skills to analyze engineering problems, break them down into manageable components, and apply appropriate mathematical and computational methods to find solutions. 4. Mathematical Modeling: Acquire skills in formulating engineering problems as mathematical models, identifying relevant variables and parameters, and selecting appropriate mathematical methods to solve these models. 5. Data Analysis: Gain proficiency in analyzing and interpreting data obtained from experiments or simulations, including statistical analysis, curve fitting, and error analysis.
Indicative Contents المحتويات الإرشادية	1.The indicative contents of an Engineering Analysis module can vary depending on the institution and the specific curriculum. However, here are some common topics and areas of study that are typically covered in an Engineering Analysis course: 2.Mathematical Foundations: 3. Calculus: Differentiation, integration, limits, and series expansions. 4.Linear Algebra: Vectors, matrices, systems of linear equations, eigenvalues, and eigenvectors. 5.Differential Equations: Ordinary differential equations, partial differential equations, and their solutions.
Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	When conducting engineering analysis, there are several strategies that can be employed to ensure accurate and effective results. Here are some common strategies used in engineering analysis: 1. Problem Definition: Clearly define the problem statement, including the objectives, constraints, and any specific requirements. This step helps

	ensure that the analysis is focused and targeted towards the desired outcome. 2. Simplification and Assumptions: Complex engineering problems can often be simplified by making reasonable assumptions. 3. Mathematical Modeling: Formulate the engineering problem as a mathematical model, incorporating relevant equations, boundary conditions, and input parameters. 4. Verification and Validation: Verify the accuracy and reliability of the analysis by comparing results with known solutions, experimental data, or established analytical models. 5. Sensitivity Analysis: Perform sensitivity analysis to assess how changes in input parameters or assumptions affect the analysis results. 6. Data Analysis and Interpretation: Analyze and interpret data obtained from experiments, simulations, or measurements. 7. Documentation and Reporting: Document the analysis methodology, assumptions, and procedures followed. Present the results and findings in a clear and concise manner, using appropriate visualizations, tables, and graphs. 8. Iterative Approach: Engineering analysis often involves an iterative approach, where initial results are analyzed, and the analysis is refined or modified based on the findings. 9. Continuous Learning and Improvement: Stay updated with the latest advancements in engineering analysis techniques, software tools, and best practices.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	63	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4.2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	62	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	4.13
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**125**		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	4	10% (10)	4-10	LO#3 ,4,5
	Assignments	8	10% (10)	2-12	LO #1 - #4
	Projects / Lab.	0	0		
	Report	3	10% (10)		
Summative assessment	**Midterm Exam**	1hr	20% (20)	8	LO #1 - #5
	Final Exam	3hr	50% (50)	15	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	
Week 2	
Week 3	
Week 4	
Week 5	
Week 6	
Week 7	
Week 8	
Week 9	
Week 10	
Week 11	
Week 12	
Week 13	
Week 14	
Week 15	Final Examination.

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	"Introduction to Engineering Analysis" 4th edition by Hagen by Kirk D. Hagen	No
Recommended Texts	"Analysis of Numerical Methods", by Eugene Isaacson, and Herbert Bishop Keller	Yes
Websites	https://www.youtube.com/watch?v=UF3ZyqKbjl4	

Grading Scheme
مخطط الدرجات

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

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Ministry of Higher Education and
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Northern Technical University
Engineering Technical College/Mosul
Department of Electrical Engineering Techniques

MODULE DESCRIPTOR FORM
نموذج وصف المادة الدراسية

Module Information
معلومات المادة الدراسية

Module Title	ENGLISH LANGUAGE (INTERMEDIATE)	**Module Delivery**	
Module Type	SUPLEMENT	✓ **Theory** ✓ **Lecture** **Lab** **Tutorial** **Practical** **Seminar**	
Module Code	EET212		
ECTS Credits	3		
SWL (hr/sem)	75		

Module Level	2	**Semester of Delivery**	2
Administering Department	DEPARTMENT OF ELECTRICAL ENGINEERING TECHNIQUES	**College**	NORTHERN TECHNICAL UNIVERSITY ENGINEERING TECHNICAL COLLEGE/MOSUL
Module Leader	Mohammed Yahya	**e-mail**	mohammed.yahya@ntu.edu.iq
Module Leader's Acad. Title	Professor	**Module Leader's Qualification**	PhD
Module Tutor	None	**e-mail**	None
Peer Reviewer Name	None	**e-mail**	None
Review Committee Approval	14/06/2023	**Version Number**	1.0

Relation With Other Modules
العلاقة مع المواد الدراسية الأخرى

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

Module Aims, Learning Outcomes and Indicative Contents
أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

Module Objectives
أهداف المادة الدراسية

The aim of the module on English Language is to develop students' proficiency and confidence in using the English language for effective communication. The module aims to enhance students' language skills, including reading, writing, listening, and speaking, as well as their understanding of English grammar, vocabulary, and usage. The module also aims to foster intercultural competence and awareness of sociolinguistic variations in English.

Learning Outcomes:

1- Demonstrate proficiency in English language skills, including reading, writing, listening, and speaking.
2- Apply appropriate grammar, vocabulary, and usage in English language communication.
3- Analyze and comprehend a variety of written and spoken texts in English.

	4- Produce coherent and well-structured written texts in English, demonstrating effective writing skills. 5- Engage in meaningful oral communication in English, demonstrating fluency, clarity, and effective presentation skills. 6- Develop intercultural competence and an understanding of sociolinguistic variations in English language use. Indicative Contents: English Language Skills Development: Development of reading skills, including comprehension and analysis of various text types. Enhancement of writing skills, including grammar, vocabulary, and coherent text production. Improvement of listening skills, including understanding spoken English in different contexts. Development of speaking skills, including fluency, pronunciation, and presentation techniques. English Grammar and Vocabulary: Review and application of grammatical structures and rules in written and spoken English. Expansion of vocabulary through the study of word formation, collocations, and idiomatic expressions. Reading Comprehension and Analysis: Practice in reading and understanding different types of texts, such as articles, essays, and literature. Analysis of texts for main ideas, supporting details, and implicit meanings. Writing Skills: Instruction and practice in various writing genres, such as essays, reports, letters, and creative writing. Emphasis on coherent paragraph and essay organization, thesis development, and effective sentence structures. Oral Communication and Speaking Skills: Practice in engaging in conversations, discussions, and presentations in English. Development of fluency, clarity, and effective communication strategies in spoken English. Intercultural Competence and Sociolinguistic Variations: Exploration of cultural aspects and intercultural communication in English-speaking contexts. Awareness of sociolinguistic variations, such as regional accents, dialects, and pragmatic conventions
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1- Demonstrate proficiency in reading, writing, listening, and speaking skills in English. 2- Apply accurate grammar, vocabulary, and language conventions in written and spoken English. 3- Comprehend and analyze a variety of written and spoken texts in English, including different genres and registers. 4- Produce well-structured and coherent written texts in English, demonstrating effective writing skills. 5- Engage in effective oral communication in English, demonstrating fluency, clarity, and appropriate presentation skills. 6- Exhibit intercultural competence and an understanding of sociolinguistic variations in English language use.

	7- These learning outcomes are designed to enhance students' overall English language proficiency and enable them to effectively communicate in various contexts. They cover key language skills, including reading, writing, listening, and speaking, as well as the ability to apply grammar and vocabulary accurately. Students will also develop critical reading and analytical skills to comprehend and interpret different types of texts. Additionally, the learning outcomes emphasize the production of well-structured written texts and effective oral communication, while fostering intercultural competence and an appreciation of sociolinguistic variations in English language use.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following: • Unit one : Introduction to the English language. • Unit two : Getting to know you • Unit three: The way we live • Unit four: It all went wrong • Unit Five : Let's go shopping. • Unit six : What do you want to do? • Unit seven : Tell me What's it like? • Unit eight : Famous couples • Unit nine : Do's and don'ts • Unit ten : Going places • Unit eleven : Scared to death • Unit twelve : Things that changed the world • Unit thirteen : Dreams and reality

Learning and Teaching Strategies
استراتيجيات التعلم والتعليم

Strategies	1-**Hands-on Experiments:** Engage students in practical experiments to deepen their understanding of circuits. 2-**Simulation Software:** Use circuit simulation software for virtual circuit design and analysis. 3-**Problem-solving Exercises:** Include various problem-solving exercises to apply circuit analysis techniques. 4-**Group Projects:** Assign collaborative projects for circuit design and construction. 5-**Real-world Applications:** Discuss practical applications of circuits in different devices and systems. 5-**Interactive Discussions:** Encourage student participation and critical thinking through open-ended questions. 6-**Conceptual Understanding:** Focus on intuitive understanding alongside mathematical analysis. 7-**Assessment Variety:** Use diverse assessment methods to gauge student understanding. 8-**Office Hours and Support:** Offer individualized assistance through office hours or online support.

Student Workload (SWL)
الحمل الدراسي للطالب

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	33	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	2.2

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

Module Evaluation
تقييم المادة الدراسية

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

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
1	Unit one : Introduction to the English language.
2	Unit two : Getting to know you
3	Unit three: The way we live
4	Unit four: It all went wrong
5	Unit Five : Let's go shopping.
6	Unit six : What do you want to do?
7	Unit seven : Tell me What's it like?
8	Unit eight : Famous couples
9	Unit nine : Do's and don'ts
10	Unit ten : Going places
11	Unit eleven : Scared to death
12	Unit twelve : Things that changed the world
13	Unit thirteen : Dreams and reality
14	Unit fourteen : Earning a living
15	Final Examination.

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	English learning new headway English course	Yes
Recommended Texts	English learning new headway English course	No
Websites	English learning new headway English course	

APPENDIX:

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

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

Ministry of Higher Education and
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Northern Technical University
Engineering Technical College/Mosul
Department of Electrical Engineering Techniques

MODULE DESCRIPTOR FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Transmission and Distribution system**			**Module Delivery**	
Module Type	**Core**			✓ **Theory** **Lecture** ✓ **Lab** **Tutorial** ✓ **Practical** ✓ **Seminar**	
Module Code	**EET400**				
ECTS Credits	**5**				
SWL (hr/sem)	**125**				
Module Level	4		**Semester of Delivery**	1	
Administering Department	**Department of Electrical Engineering Techniques**		**College**	**Northern Technical University** **Engineering Technical College/Mosul**	
Module Leader	Noha Abedalbary Abedaljwad		**e-mail**	Noha.m.aljwady@ntu.edu.iq	
Module Leader's Acad. Title	Lecturer		**Module Leader's Qualification**	Master	
Module Tutor	non		**e-mail**	E-mail	
Peer Reviewer Name	Name		**e-mail**	E-mail	
Scientific Committee Approval Date	01/06/2023		**Version Number**	1.0	

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

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	1. Students will learn parts of power system, types of distribution system, Study the characteristic and performance of transmission lines. 2. Mechanical design of T.L, 3. The importance of grounding all voltage levels of the power system>
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	Important: Write at least 6 Learning Outcomes, better to be equal to the number of study weeks. 1. The parts of power systems, conductor materials of Transmission lines. 2. Meaning of distribution system and their classification . 3. Types of Transmission lines and their charecteristic. 4. Transmission lines constants . 5. Mechanical design of transmission lines (sag) . 6. Grounding of all voltage levels in the power system . 7. The meaning of corona and Ferranti phenomenon's
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. <u>Part A – Components of power system</u> Distribution systems, types,[8 hrs] transmission lines, constants of T.L,. [16 hrs] Voltage regulation, Corona and Ferranti phenomenon's. <u>Part B – Mechanical design of T.L</u> _Calculation of sag when the points of supports at the same and different.[8 hrs] <u>Part C-Grounding.</u> The importance of grounding the voltage levels of the power[8hr] <u>Part D-Sub Station.</u> The function and types of sub station [4hr]

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	1-Conceptual Understanding: Explain Transmission and Distribution systems 2-Mathematical Foundations: Provide a solid mathematical for types of transmission lines and distribution systems. 3-Review and Assessment: Regularly review key concepts and provide formative assessments to gauge students' understanding. Offer constructive feedback on their performance to help them identify areas for improvement.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	93	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	6.2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	32	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	2.1
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**125**		

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

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Components of power system, Conductor materials, and advantages and limitation of high voltage transmission
Week 2	Classification of distribution systems, types of Dc distribution systems (radial and ring)
Week 3	Ring Distribution system,point of minimum voltage.
Week 4	Regulation of transmission lines and Ferranti effect
Week 5	Corona phenomenon
Week 6	A,B,C and D constants of short lines.
Week 7	A,B,C and D constants of medium lines.
Week 8	Long Lines
Week 9	Series and parallel connection of T.L
Week 10	Mechanical design of T.L (sag points of support points at same level)
Week 11	Sag with support points at different level.
Week 12	Equipment grounding, methods of neutral grounding,
Week 13	Transformer grounding , grounding by single phase transformer
Week 14	Types of sub-stations
Week 15	Final Examination

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: Introduction to Transmission line Model that located in the laboratory.
Week 2	Lab 2: Transmission line constants (shot and open test)
Week 3	Lab 3: Line characteristic for resistive load.
Week 4	Lab 4: Line characteristic for inductive load.
Week 5	Lab 5: Line characteristic for capacitive load.
Week 6	Lab 6: Series connection of transmission lines.
Week 7	Lab 7: Parallel connection of transmission lines
Week8	Lab 8: Connection of T.L to supply through step up transformer.
Week9	Lab 9: Connection of T.L to load through step down transformer
Week10	Lab 10: Connection of transformer at both end of T.L.

Week11	Lab 11:Neutral earthing of transformer
Week12	Lab 12: Zig-Zag transformer.
Week13	Lab 13: Sequence determination of transformer.
Week14	Lab 14: Review
Week15	Examination

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	A Course in Electrical Power, P.V Gupta	Yes
Recommended Texts	MODRN POWER SYSTEM ANALYSIS , JOHN WILLY& SONS	No
Websites	https://www.osha.gov/etools/electric-power/illustrated-glossary/transmission-lines	

Grading Scheme
مخطط الدرجات

Group	Grade	التقدير	Marks %	Definition
Success Group (50 - 100)	**A -** Excellent	امتياز	90 - 100	Outstanding Performance
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	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
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	F – Fail	راسب	(0-44)	Considerable amount of work required

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Ministry of Higher Education and
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Department of Electrical Engineering Techniques

MODULE DESCRIPTOR FORM

نموذج وصف المادة الدراسية

Module Information
معلومات المادة الدراسية

Module Title	**ELECTRIC MACHINE DRIVES**	**Module Delivery**	
Module Type	CORE	✓ **Theory**	
Module Code	**EET401**	**Lecture**	
ECTS Credits	5	✓ **Lab**	
SWL (hr/sem)	125	**Tutorial**	
		✓ **Practical**	
		✓ **Seminar**	

Module Level	4	**Semester of Delivery**	1
Administering Department	**DEPARTMENT OF ELECTRICAL ENGINEERING TECHNIQUES**	**College**	**NORTHERN TECHNICAL UNIVERSITY ENGINEERING TECHNICAL COLLEGE/MOSUL**
Module Leader	Laith Akram Mohammed	**e-mail**	Laith.akram@ntu.edu.iq
Module Leader's Acad. Title	ASS. Prof	**Module Leader's Qualification**	PhD
Module Tutor	None	**e-mail**	None
Peer Reviewer Name	None	**e-mail**	None
Review Committee Approval	13/06/2023	**Version Number**	1.0

Relation With Other Modules
العلاقة مع المواد الدراسية الأخرى

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

Module Aims, Learning Outcomes and Indicative Contents
أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

Module Objectives أهداف المادة الدراسية	**Students will learn the principle of ;** 1. **Comparison of AC and DC Drives** 2. **AC-DC converter DC Motor Drives** 3. **DC-DC chopper DC Motor Drive** 4. **AC Motor Drives**
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1-Knowledge Acquisition: Students will acquire a comprehensive understanding of the fundamental concepts and principles of AC and DC Electrical Drive Circuit . 2-AC To DC DC motor drive circuit: Students have the ability to design a controlled rectifier dc motor drive , derive the equation of power electronics circuit, harmonics, power quality, voltage and current rating, and four quadrant drive.

	3-Analyze power electronics of chopper dc to dc drive: four-quadrant, mode operation power quality and duty cycle variation. 4-AC drive Systems: Students will acquire an understanding of power electronic circuit fed ac motor drive with stator voltage speed control. 6- Analyze the drive power electronic circuit for speed control using rotor voltage control. 7- understanding the speed control using frequency control. 8. analyze the current control induction motor drive with the current source inverter. 9-Laboratory Skills: Students will develop practical skills in using circuit simulation software and laboratory equipment to design, analyze, and verify the performance of different AC and DC drive circuits
Indicative Contents المحتويات الإرشادية	Indicative content includes the following: ● Part A – Application controlled rectifier DC motor drive analyze one, two, and Four quadrant power electronic dc motor drive. [10 hrs] ● Part B – application of chopper dc motor : Design and analyze one-quadrant and four-quadrant dc motor drives. [10 hrs] ● Part C Mode of operation of dc motor drive . motoring and regenerative operation of dc motor drive for chopper drive and controlled rectifier drive[10 hrs] ● Part D Ac motor drive mode of operation. Ac motor drive induction and synchronous drive for motoring and regenerative and plugging mode operation. [10 hrs] ● Part E stator voltage, frequency and current control of induction motor ac voltage controller fed induction motor drive(speed control, power factor calculation of the drive, harmonics determination. [16 hrs]

Learning and Teaching Strategies
استراتيجيات التعلم والتعليم

Strategies	1-Conceptual Understanding: the comparison of ac and dc drives. 2-Mathematical Foundations: Provide a solid mathematical foundation for DC and AC Drive circuits. Teach students the use of Matlab program to analyze circuits. 3-Problem-Solving Skills: Dedicate adequate time to problem-solving exercises and examples. 5-Simulation Tools: Introduce simulation MATLAB software tools that allow students to simulate circuits and observe their behavior. 6-Review and Assessment: Regularly review key concepts and provide formative assessments to gauge students' understanding. Offer constructive feedback on their performance to help them identify areas for improvement.

Student Workload (SWL)
الحمل الدراسي للطالب

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	93	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	6.2

Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	32	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	2.13
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	125		

Module Evaluation
تقييم المادة الدراسية

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

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
Week 1	**AC and DC Drives, compassion, applications**
Week 2	**Load Toque Requirement, types Load Torque**
Week 3	**Single Phase AC to DC converter DC Motor Drives, Semiconverter drive**
Week 4	**Single Phase AC to DC full Converter Drive, Dual Converter**
Week 5	**Three–Phase AC to DC converter DC Motor Drives, Semiconverter drive, full Converter Drive, Dual Converter**
Week 6	**DC –DC chopper DC Motor Drives, one Quadrant Drive**
Week 7	**Two Quadrant Drive, Four Quadrant Drive**
Week 8	**AC Drives , Induction Motor Drive, Stability of induction motor**
Week 9	**Stator voltage speed control of induction Motor**
Week 10	**Rotor voltage control of induction Motor**
Week 11	**Frequency speed control of induction motor, voltage to frequency speed control of induction motor**
Week 12	**Current control of AC Motor Drive**
Week 13	**Synchronous Motor Drive**
Week 14	**Direct Torque Control of AC Motor Drive**
Week 15	**Final Examination**

Delivery Plan (Weekly Lab. Syllabus)
المنهاج الاسبوعي للمختبر

	Material Covered
Week 1	Lab 1: Introduction to Matlab Model Power Electronics circuit design

Week 2	Lab 2: AC –Dc semi converter separately excited, Series dc motor Drive
Week 3	Lab 3:AC –Dc Full separately excited, Series dc motor Drive
Week 4	Lab 4:DC-DC ONE- Quadrant DC Motor Drive
Week 5	Lab 5:DC-DC Two Quadrant DC Motor Drive.
Week 6	Lab 6:Stator Voltage Control of Induction Motor.
Week 7	Lab 7:Rotor Voltage Control of Induction Motor
Week 8	Lab 8:Frequency Control of Induction Motor
Week 9	Lab 9: Voltage to frequency Control of Induction Motor
Week 10	Lab 10: slip power control by dc converter of Induction Motor
Week 11,12	Lab 11:Single phase DC-AC converter Motor Drive
Week 13	Lab 12: Three- phase DC-AC converter Motor Drive
Week 14	Review

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	**Gopal K. Dubey " power semiconductor controlled Drives" 1st edition, 1989**	Yes
Recommended Texts	**Mohummed Rashid" Power electronics circuits, Devices and application" 4th edition, 2014**	No
Websites	https://www.amazon.com/Power-Electronics-Circuits-Devices-Applications/dp/0133125904	

APPENDIX:

GRADING SCHEME
مخطط الدرجات

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

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

Ministry of Higher Education and Scientific Research - Iraq
Northern Technical University
Engineering Technical College/Mosul
Department of Electrical Technology Engineering

MODULE DESCRIPTOR FORM

نموذج وصف المادة الدراسية

Module Information

معلومات المادة الدراسية

Module Title	POWER SYSTEM ANALYSIS	**Module Delivery**	
Module Type	CORE	✓ **Theory**	
Module Code	EET402	**Lecture**	
ECTS Credits	5	✓ **Lab**	
SWL (hr/sem)	125	**Tutorial**	
		✓ **Practical**	
		✓ **Seminar**	

Module Level	4	**Semester of Delivery**	1
Administering Department	DEPARTMENT OF COMPUTER TECHNIQUES ENGINEERING	**College**	NORTHERN TECHNICAL UNIVERSITY ENGINEERING TECHNICAL COLLEGE/MOSUL
Module Leader	Dr. MAHMOOD TAHA ALKHAYYAT	**e-mail**	m.t.alkhayyat@ntu.edu.iq
Module Leader's Acad. Title	Asst. Prof.	**Module Leader's Qualification**	Ph.D.
Module Tutor	None	**e-mail**	None
Peer Reviewer Name	None	**e-mail**	None
Review Committee Approval	7/06/2023	**Version Number**	1.0

Relation with Other Modules

العلاقة مع المواد الدراسية الأخرى

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

Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

Module Objectives أهداف المادة الدراسية	The aim of the Power System Analysis module is to provide 4th-year undergraduate students with a comprehensive understanding of the analysis and operation of electric power systems. The module focuses on developing the necessary theoretical foundations and practical skills to analyze and solve power system problems encountered in the industry. It aims to equip students with the knowledge required to evaluate system performance, fault current calculations and circuit breakers ratings, and enhance the reliability of power systems.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	Upon completion of the Power System Analysis module, students should be able to: 1. Understand the fundamental concepts and principles of power system analysis. 2. Apply appropriate mathematical and computational techniques for power system analysis.

	3. Analyze and evaluate fault current of power transmission and distribution networks. 4. Design and analyze protection schemes MVA rating for power system protection components. 5. Gain a quite knowledge for power flow analysis. 6. Identify and mitigate power system voltage dynamic variation issues. 7. Utilize software tools for power system analysis and simulation. 8. Demonstrate the ability to communicate power system analysis results effectively.
Indicative Contents المحتويات الإرشادية	1. Introduction to Power Systems: • Overview of power generation, transmission, and distribution. • Basic components and operating principles of power systems. • Overview of power system analysis techniques. 2. Power Flow Analysis: • Formulation of power flow equations. • Methods for solving power flow equations (e.g., Gauss-Seidel, Newton-Raphson). • Bus classification and voltage control. • Analysis of system losses and reactive power compensation. 3. Fault Analysis and Protection: • Short circuit analysis and fault calculations. • Fundamentals of protective relaying. • Coordination of protective devices. • Introduction to arc flash analysis. 4. Power System Analysis Software: • Introduction to widely used power system analysis software (e.g., PWS/MATLAB/ETAP). • Hands-on exercises using software tools for power system analysis and simulation.

Learning and Teaching Strategies
استراتيجيات التعلم والتعليم

Strategies	1. Understand the Fundamentals: Start by building a strong foundation in the basic principles of power systems, including the concepts of power, voltage, current, and energy. 2. Learn the Analytical Techniques: Power system analysis involves various analytical techniques, such as load flow analysis, fault analysis. Study each technique in detail, understand the underlying principles, and practice solving numerical problems. 3. Utilize Software Tools: Power system analysis often relies on computer-based tools for simulations and calculations. Familiarize yourself with widely used software tools such as MATLAB, ETAP, or PowerWorld Simulator. These tools enable you to simulate and analyze complex power system scenarios, enhancing your practical understanding. 4. Solve Practice Problems: Practice is crucial for mastering power system analysis. Work through a variety of practice problems and exercises that cover different aspects of power systems. This approach will help you gain

	proficiency in applying theoretical concepts to practical situations and develop problem-solving skills. 5. Study Real-World Power Systems: Study and analyze real-world power systems to understand their complexity and challenges. Investigate case studies of power system failures, blackouts. Analyze the solutions and approaches used to address these issues, as they offer valuable insights into practical power system analysis.

Student Workload (SWL)
الحمل الدراسي للطالب

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	93	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	6.2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	32	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	2.133
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	125		

Module Evaluation
تقييم المادة الدراسية

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

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
1	Per unit method • Introduction to three-phase systems • Per-unit system and its advantages • Conversion between per-unit and actual values
2	Single line diagram
3	Admittance formation
4	Impedance diagram
5	Symmetrical faults • Introduction to symmetrical faults • Calculation of transient fault currents of three phase generator • Fault current and contribution to the fault current • Selection of protective devices based on fault analysis results
6, 7	Symmetrical components
8,9	Sequence networks • Sequence networks of three phase load • Sequence networks of three transformer • Sequence networks of three phase generator

	• Sequence networks of three phase line
9,10, 11	Unsymmetrical faults. • Single line to ground fault • Line to line fault • Double line to ground fault
12,13,14	Power Flow Analysis • Introduction to power flow analysis • Bus classification and types • Gauss-Seidel method for power flow solution • Power flow with including voltage bus control • Power flow with generator power limitations • Handling of voltage-controlled buses and reactive power sources • Consideration of tap-changing transformers and phase shifters
15	Final Examination

Delivery Plan (Weekly Lab. Syllabus)
المنهاج الاسبوعي للمختبر

	Material Covered
Week 1	Lab 1: Introduction to MATLAB Model and Power World Simulator PWS
Week 2	Lab 2: Per unit system with MATLAB
Week 3	Lab 3: Admittance calculation using PWS/ MATLAB
Week 4	Lab 4: Power flow calculation of three bus system without PV bus
Week 5	Lab 5: Power flow calculation of three bus system with PV bus
Week 6	Lab 6: Power flow calculation of three bus system with PV bus with load change
Week 7	Lab 7: Power flow calculation of three bus system including PV bus with load change and reactive power limitation
Week 8	Lab 8: Sequence voltages/currents calculation using MATLAB
Week 9	Lab 9: Sequence impedances calculation using PWS
Week 10	Lab 10:Symmetrical fault analysis using MATLAB
Week 11	Lab 11:Effects of grounding resistance on voltage of unfaulted lines
Week 12	Lab 12:Sequence networks calculation using PWS
Week 13	Lab 13:Unbalanced fault analysis using PWS
Week 14	Lab 14: Review

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	**Available in the Library?**
Required Texts	1. J. Duncan Glover, Mulukutla S. Sarma, and Thomas J. Overbye, "Power System Analysis and Design" This widely used textbook covers both the basic principles and advanced topics in power system analysis and design. It includes chapters on power flow, transient stability, and symmetrical components, among others.	Yes

Required Texts	2. *Grainger J. J., Stevenson Jr W. D,* Power System Analysis	no
Recommended Texts	3. "Power System Analysis" by Hadi Saadat: This comprehensive textbook covers all fundamental aspects of power system analysis, including power flow, fault analysis, stability analysis, and economic dispatch. It provides a solid foundation for understanding power system analysis techniques.	no
Websites	4. "Power System Analysis: Short-Circuit Load Flow and Harmonics" by J.C. Das: This book focuses on the practical aspects of power system analysis, covering topics such as load flow, short-circuit analysis, and harmonic analysis. It includes numerous examples and case studies to help readers understand real-world applications.	

APPENDIX:

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

Note:

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

Ministry of Higher Education and
Scientific Research - Iraq
Northern Technical University
Engineering Technical College/Mosul
Department of Electrical Engineering Techniques

MODULE DESCRIPTOR FORM
نموذج وصف المادة الدراسية

Module Information
معلومات المادة الدراسية

Module Title	**ELECTRICAL POWER GENERATION STATION**		
Module Type	CORE	✓ **Theory**	
Module Code	EET403	**Lecture** ✓ **Lab**	
ECTS Credits	5	**Tutorial** ✓ **Practical**	
SWL (hr/sem)	125	✓ **Seminar**	

Module Level	4	**Semester of Delivery**	1
Administering Department	DEPARTMENT OF ELECTRICAL ENGINEERING TECHNIQUES	**College**	NORTHERN TECHNICAL UNIVERSITY ENGINEERING TECHNICAL COLLEGE/MOSUL
Module Leader	Fawaz S. Abdullah	**e-mail**	fawaz.sultan@ntu.edu.iq
Module Leader's Acad. Title	Assist.Professor	**Module Leader's Qualification**	Ph.D
Module Tutor	None	**e-mail**	None
Peer Reviewer Name	None	**e-mail**	None
Review Committee Approval	14/06/2023	**Version Number**	1.0

Relation With Other Modules
العلاقة مع المواد الدراسية الأخرى

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

Module Aims, Learning Outcomes and Indicative Contents
أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

Module Objectives أهداف المادة الدراسية	The student will be familiar with the methods of generating electrical energy by the variance electrical stations. Each type of these station has a special method for generating electrical energy.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Understand the principles of electrical power generation and the different types of power stations. 2. Identify the components and systems of a power generation station, including turbines, generators, transformers, and switchgear. 3. Explain the operation and maintenance requirements of various power generation technologies, such as coal-fired, gas-fired, nuclear, hydroelectric, and renewable energy systems. 4. Analyze the environmental and social impacts of power generation, including air and water pollution, greenhouse gas emissions, land use, and community health and safety concerns. 5. Evaluate the economic and regulatory factors that influence power generation, including fuel costs, government policies, and market demand. 6. Apply engineering principles to design and optimize power generation systems for efficiency, reliability, and sustainability.

	7. Develop communication and teamwork skills by collaborating with peers on projects related to power generation station design and operation. 8. Demonstrate knowledge of safety procedures and regulations in power generation operations, including electrical safety, fire prevention, and emergency response planning.
Indicative Contents المحتويات الإرشادية	1. Introduction to electrical power generation and the importance of electricity in modern society 2. Types of power stations, including thermal, hydroelectric, nuclear, and renewable energy systems 3. Components of a power generation station, including turbines, generators, transformers, and switchgear 4. Operation and maintenance requirements of different power generation technologies, such as coal-fired, gas-fired, nuclear, hydroelectric, and renewable energy systems 5. Environmental and social impacts of power generation, including air and water pollution, greenhouse gas emissions, land use, and community health and safety concerns 6. Economic and regulatory factors that influence power generation, including fuel costs, government policies, and market demand 7. Design principles for efficient, reliable, and sustainable power generation systems 8. Safety procedures and regulations in power generation operations, including electrical safety, fire prevention, and emergency response planning 9. Case studies of successful power generation projects around the world 10. Emerging technologies in power generation, such as energy storage and smart grids.

Learning and Teaching Strategies
استراتيجيات التعلم والتعليم

Strategies	1. Types of power stations, including thermal, hydroelectric, nuclear, and renewable energy systems: This section will describe the different types of power stations and their key features, including the fuel sources used, efficiency, and environmental impacts. 2. Components of a power generation station, including turbines, generators, transformers, and switchgear: This section will provide an overview of the key components of a power generation station and their functions in converting fuel into electricity. 3. Operation and maintenance requirements of different power generation technologies, such as coal-fired, gas-fired, nuclear, hydroelectric, and renewable energy systems: This section will discuss the operational requirements and maintenance considerations for different types of power generation technologies. 4. Environmental and social impacts of power generation, including air and water pollution, greenhouse gas emissions, land use, and community health and safety concerns: This section will examine the environmental and social impacts associated with power generation and the measures that can be taken to mitigate these impacts. 5. Economic and regulatory factors that influence power generation, including fuel costs, government policies, and market demand: This section will explore the

	economic and regulatory factors that influence power generation, including the cost of fuel, government policies, and market demand for electricity. 6. Design principles for efficient, reliable, and sustainable power generation systems: This section will discuss the design principles that are critical for building efficient, reliable, and sustainable power generation systems. 7. Safety procedures and regulations in power generation operations, including electrical safety, fire prevention, and emergency response planning: This section will describe the safety procedures and regulations that must be followed in power generation operations to ensure the safety of workers and the surrounding community. 8. Case studies of successful power generation projects around the world: This section will highlight successful power generation projects from around the world and the key factors that contributed to their success. 9. Emerging technologies in power generation, such as energy storage and smart grids: This section will explore emerging technologies in power generation, including energy storage and smart grids, and their potential to transform the way electricity is generated and distributed.

Student Workload (SWL)
الحمل الدراسي للطالب

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	78	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	5.2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	47	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	3.133
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	125		

Module Evaluation
تقييم المادة الدراسية

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

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
1	Introduction
2	Thermal stations.
3	Hydro-electric stations.
4	Diesel electric stations.
5	Nuclear power stations.

6	Gas turbine plants.
7	Combined operation of power system.
8	Major electrical equipment's in power stations.
9	Variable load problem.
10	Power plant economics.
11	Solar energy.
12	Wind turbine energy.
13	Geothermal energy.
14	Tidal energy.
15	Final Examination

Delivery Plan (Weekly Lab. Syllabus)
المنهاج الاسبوعي للمختبر

	Material Covered
1	Lab 1: Types of electrical power generation.
2	Lab 2: Thermal station diagram.
3	Lab 3: Hydro plant diagram.
4	Lab 4: Diagram of the diesel electric station.
5	Lab 5: Diagram of the nuclear power station.
6	Lab 6: Gas turbine plant diagram.
7	Lab 7: Power system (combined operation diagram).
8	Lab 8: Main electrical equipment's of power stations.
9	Lab 9: Illustrate the problems of variable load.
10	Lab 10: Economics of power plants.
11	Lab 11: Solar energy system diagram.
12	Lab 12: Wind turbine system diagram.
13	Lab 13: Geothermal system diagram.
14	Lab 14: Review

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	1. Power Generation Technologies by Paul Breeze 2. Electric Power Generation, Transmission, and Distribution by Leonard L. Grigsby 3. Power Plant Engineering by R.K. Rajput 4. Renewable Energy Systems: The Choice and Modeling of 100% Renewable Solutions by Henrik Lund 5. Power System Analysis and Design by J. Duncan Glover, Mulukutla S. Sarma, and Thomas Overbye 6. Wind Energy Engineering: A Handbook for Onshore and Offshore Wind Turbines by Trevor M. Letcher 7. Solar Energy Engineering: Processes and Systems by Soteris A. Kalogirou	Yes

	8. Microgrids and Active Distribution Networks by Nikos Hatziargyriou and Francisco M. Gonzalez-Longatt 9. Energy Storage for Sustainable Microgrid by Kankar Bhattacharya and Rajesh Kumar Malhotra 10. Blockchain Enabled Applicati…	
Recommended Texts	Electric Power Generation, Transmission, and Distribution by Leonard L. Grigsby	No
Websites	ELECTRICAL POWER GENERATION STATION https://www.amazon.com/Electric-Generation-Transmission-Distribution-Engineering/dp/1439856281	

APPENDIX:

GRADING SCHEME مخطط الدرجات				
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Ministry of Higher Education and
Scientific Research - Iraq
Northern Technical University
Engineering Technical College/Mosul
Department of Electrical Engineering Techniques

MODULE DESCRIPTOR FORM

نموذج وصف المادة الدراسية

Module Information

معلومات المادة الدراسية

Module Title	**CONTROL SYSTEMS ANALYSIS**	**Module Delivery**	
Module Type	CORE	✓ **Theory** **Lecture** ✓ **Lab** **Tutorial** ✓ **Practical** ✓ **Seminar**	
Module Code	EET404		
ECTS Credits	5		
SWL (hr/sem)	125		
Module Level	4	**Semester of Delivery**	1
Administering Department	DEPARTMENT OF ELECTRICAL ENGINEERING TECHNIQUES	**College**	NORTHERN TECHNICAL UNIVERSITY ENGINEERING TECHNICAL COLLEGE/MOSUL
Module Leader	Taha Ahmad Hussein	**e-mail**	taha.hussien@ntu.edu.iq
Module Leader's Acad. Title	Professor	**Module Leader's Qualification**	Master
Module Tutor	None	**e-mail**	None
Peer Reviewer Name	None	**e-mail**	None
Review Committee Approval	14/06/2023	**Version Number**	1.0

Relation With Other Modules

العلاقة مع المواد الدراسية الأخرى

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

Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

Module Objectives أهداف المادة الدراسية	Students will learn the theory and practice of control system engineering with emphasis on the analysis and design of feedback system. Control systems are found in wide of applications form aircrafts to robots and process control system. Students will be able to model , design and analyze electrical systems in frequency and time domain. The purpose of this module is to enable students to develop a knowledge of: 1. steady-state error analysis and design, 2. system performance analysis and measurement, control system design and analysis for continuous systems using classical techniques. 3. system stability 4. Students will attain skills in using software tools to represent, analyze, interpret, and design control system responses.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Analysis ,design and Modeling systems in the frequency domain. 2. Analysis ,design and Modeling systems in the time domain. 3. Calculate the Time response. 4. Analyses system Stability

	5. Sketch the Root locus for varying system gain.
Indicative Contents المحتويات الإرشادية	Indicative Content and Learning Activities CONTROL SYSTEMS SOFTWARE TOOLS Introduction to software for control systems analysis, simulation, design and evaluation, and the use of appropriate software toolboxes to address the design and analysis needs of the module. FREQUENCY DOMAIN Develop a mathematical model by applying the fundamental physical laws of science and engineering. From these equations we will obtain the relationship between the system's output and input . TIME DOMAIN The time domain approach (also referred to state-space approach) is a unified method for modeling ,analyzing and designing a wide range of systems. The time domain can be used to represent nonlinear systems. It can also handle systems with nonzero initial conditions. TIME RESPONSE After obtaining a mathematical representation of a subsystem . the subsystem is analyzed for its transient and steady state response to see if these characteristics yield the desired behavior. STABILITY Stability is the most important system specification . if a system is unstable , transient response and steady state errors are moot points. An unstable system cannot be designed for a specific transient response or steady state error requirement. for the system to be stable , certain. Requirements must be met. ROOT LOCUS Root locus , a graphical representation of the closed-loop poles as A system parameters is varied, is a powerful method of the analysis and design for stability and transient response.

Learning and Teaching Strategies
استراتيجيات التعلم والتعليم

Strategies	1-**Hands-on Experiments:** Engage students in practical experiments to deepen their understanding of control engineering. 2-**Simulation Software:** Use MATLAB simulation software for virtual control design and analysis. 3-**Problem-solving Exercises:** Include various problem-solving exercises to apply control techniques. 4-**Group Projects:** Assign collaborative projects for circuit design and construction. 5-**Real-world Applications:** Discuss practical applications of control theory in different systems. 5-**Interactive Discussions:** Encourage student participation and critical thinking through open-ended questions. 6-**Conceptual Understanding:** Focus on intuitive understanding alongside

	mathematical analysis. 7-**Assessment Variety:** Use diverse assessment methods to gauge student understanding. 8-**Office Hours and Support:** Offer individualized assistance through office hours or online support.

Student Workload (SWL)
الحمل الدراسي للطالب

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	78	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	5.2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	47	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	3.133
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	125		

Module Evaluation
تقييم المادة الدراسية

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

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
1	Modeling in the frequency domain - Laplace transform review
2	The transfer function
3	Electrical network transfer function
4	Modeling in the time domain- General state space representation
5	Converting a transfer function to state space
6	Converting from state space to transfer function
7	Time response - Poles , zeros, and system representation
8	First order systems
9	Second order systems
10	Stability- Routh-Hurwitz criterion
11	Stability in state space
12	Defining the root locus
13	Properties of the root locus
14	Sketching the root locus
15	Final Examination

Delivery Plan (Weekly Lab. Syllabus)
المنهاج الاسبوعي للمختبر

	material covered
1	LAB 1: OPERATIONAL AMPLIFIER (OP AMPS) INVERTING AND NON-INVERTING

2	LAB 2: OP AMP APPLICATIONS- ADDER CIRCUIT
3	LAB 3: OP AMP APPLICATIONS- SUBTRACTOR CIRCUIT
4	LAB 4: OP AMP APPLICATIONS- DIFFERENTIATOR CIRCUIT
5	LAB 5: OP AMP APPLICATIONS- INTEGRATOR CIRCUIT
6	LAB 6: SEQUENTIAL OPERATION OF ALTERNATING CURRENT MOTORS CONTROL USING (ON-OFF) SWITCHING
7	LAB 7: TWO SINGLE-PHASE INDUCTION MOTOR
8	LAB 8: THREE STEPS CONTROL
9	LAB 9: INTRODUCTION TO PLC, ITS PARTS, TYPES, AND PROGRAM METHODS
10	LAB 10: MANUAL PROGRAMMING OF PLC
11	LAB 11: ALTERNATING CURRENT MOTORS CONTROL USING (ON - OFF) SWITCHING USING PLC
12	LAB 12: CONTROL THE OPERATION OF TWO SINGLE-PHASE INDUCTION MOTOR SEQUENTIALLY USING PLC
13	LAB 13: THREE STEPS CONTROL USING PLC
14	LAB 14: REVIEW

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Norman S. Nise , Control system engineering, 7th edition , 2015, WILEY	Yes
Recommended Texts	Katsuhiko Ogata, modern control engineering, 5th edition , 2010 , Pearson.	Yes
Websites	Control system engineering https://www.academia.edu/35425584/Control_System_By_Norman_nise	

APPENDIX:

GRADING SCHEME
مخطط الدرجات

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

Note:

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

Ministry of Higher Education and
Scientific Research - Iraq
Northern Technical University
Engineering Technical College/Mosul
Department of Computer Techniques Engineering

MODULE DESCRIPTOR FORM

نموذج وصف المادة الدراسية

Module Information

معلومات المادة الدراسية

Module Title	**PROJECT1**	**Module Delivery**	
Module Type	CORE	**Theory** ✓ **Lecture**	
Module Code	EET405	✓ **Lab** **Tutorial** ✓ **Practical** **Seminar**	
ECTS Credits	5		
SWL (hr/sem)	125		
Module Level	4	**Semester of Delivery**	1
Administering Department	DEPARTMENT OF COMPUTER TECHNIQUES ENGINEERING	**College**	NORTHERN TECHNICAL UNIVERSITY ENGINEERING TECHNICAL COLLEGE/MOSUL
Module Leader	All Acadimic staf	**e-mail**	
Module Leader's Acad. Title		**Module Leader's Qualification**	
Module Tutor	None	**e-mail**	None
Peer Reviewer Name	None	**e-mail**	None
Review Committee Approval	21/06/2023	**Version Number**	1.0

Relation With Other Modules

العلاقة مع المواد الدراسية الأخرى

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

Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

Module Objectives أهداف المادة الدراسية	
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	

Indicative Contents المحتويات الإرشادية	•

Learning and Teaching Strategies
استراتيجيات التعلم والتعليم

Strategies	

Student Workload (SWL)
الحمل الدراسي للطالب

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	93	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	6.2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	32	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	2.1
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	125		

Module Evaluation
تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**				
	Assignments		10% (10)		
	Projects / Lab.	14	15% (10)	Continuous	All
	Report	1	10% (10)	13	LO # 13
Summative assessment	**Midterm Exam**	hr	20% (20)	8	LO # 1 - 86
	Final Exam	hr	50% (50)	15	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
1,2	**Project Selection and Proposal** • Introduction to project selection criteria and guidelines • Identifying a research problem or engineering challenge in biomedical engineering • Formulating a project proposal with clear objectives and scope
3,4,5	**Literature Review and Background Research** • Conducting a comprehensive literature review on the chosen project topic • Evaluating existing research and technologies relevant to the project • Analyzing and synthesizing information to inform the project design
6,7,8,9	**Project Planning and Design** • Developing a detailed project plan with milestones and timelines • Defining project requirements and specifications • Conceptualizing and designing solutions to address the identified problem or challenge
10,11,12, 13,14	**Prototyping and Experimental Work** • Building prototypes or designing experiments to test and validate the proposed solution • Acquiring and assembling necessary components or materials for the project • Conducting experiments, data collection, and measurements as required

Delivery Plan (Weekly Lab. Syllabus)
المنهاج الاسبوعي للمختبر

	Material Covered
	This part varies depending on the subject of the project which is differ from group to group

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts		
Recommended Texts		
Websites		

APPENDIX:

GRADING SCHEME
مخطط الدرجات

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

Note:

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Ministry of Higher Education and
Scientific Research - Iraq
Northern Technical University
Engineering Technical College/Mosul
Department of C-Electric Techniques Engineering

MODULE DESCRIPTOR FORM

نموذج وصف المادة الدراسية

Module Information

معلومات المادة الدراسية

Module Title	**Professional ethics**	**Module Delivery**	
Module Type	SUPLEMENT	✓ **Theory** **Lecture** **Lab** **Tutorial** **Practical** ✓ **Seminar**	
Module Code	EET406		
ECTS Credits	3		
SWL (hr/sem)	75		
Module Level	4	**Semester of Delivery**	2
Administering Department	DEPARTMENT OF ELECTRI TECHNIQUES ENGINEERING	**College**	NORTHERN TECHNICAL UNIVERSITY ENGINEERING TECHNICAL COLLEGE/MOSUL
Module Leader	**Dr. Bashar N. Ahmed**	**e-mail**	.basharnadeem@ntu.edu.iq
Module Leader's Acad. Title	Prof.	**Module Leader's Qualification**	PHD
Module Tutor	None	**e-mail**	None
Peer Reviewer Name	None	**e-mail**	None
Review Committee Approval	21/06/2023	**Version Number**	1.0

Relation With Other Modules

العلاقة مع المواد الدراسية الأخرى

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

Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

Module Objectives أهداف المادة الدراسية	أن يعرف الطالب الجامعي أخلاقيات مهنة الهندسة ومكانتها في المجتمع وتطبيقاتها في واقع العمل، ودورها في إنجاح عمله ، وتوفر الفرصة للطالب لتحليل الظواهر الأخلاقية المحدثة في بيئة العمل وأن يتمكن من التنبؤ بآثارها ويحدد موقفه منها وأن يتعلم وسائل تندرسيخ الأخلاقيات الحميدة ووسائل حل ما يواجهه من عقبات في سبيل تطبيقها.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	**1** - فهم ومعرفة وأدراك المباديء الرئيسة لأخلاقيات مهنة الهندسة من أحد ومصادرها وأنواعها و الاليات المستخدمة في إنتاجها وتحصيلها **2**- تمكين الطالب من معرفة الأساسيات التي يستخدمها في المادة العلمية **3**- تعليل الظواهر السلبية التي تقابله في عمله وتقديم التفسيرات لما تحدثه من نتائج **4**- فهم اهم النظم التي تتشكل منها مجموعة القيم التي يجب أن يتصف بها العاملون في مجال الهندسة ومنها القيم الدينية والوطنية والقانونية

Indicative Contents المحتويات الإرشادية	❖ ماهي الأخلاق، وما هو العمل، وتعريف بمصطلح اخلاقيات المهنة ، ومجموعة القيم واخلاقيات المهنة وأنماط السلوك في الأخلاقي في المهنة ووسائل وأساليب ترسيخ أخلاقيات المهنة.(٤ ساعات) ❖ أخلاقيات ممارسة المهن الهندسية (٦ ساعات) ❖ ، وميثاق أخلاق مهنة الهندسة لاتحاد المهندسين العرب(٦ ساعات)، ❖ وأخلاقيات المهندس في التعليم والتدريب المستمر(٦ ساعات) ❖ المشاكل والمعوقات ونقاشات الطلبة (١٢ساعة)

Learning and Teaching Strategies
استراتيجيات التعلم والتعليم

Strategies	-استراتيجية التفكير حسب قدرة الطالب 2-استراتيجية مهارة التفكير العالية 3-استراتيجية التفكير الناقد في التعلم 4-العصف الذهني

Student Workload (SWL)
الحمل الدراسي للطالب

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	33	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	2.2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	42	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	2.8
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	75		

Module Evaluation
تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	4	10% (10)	5, 10	2 ,4
	Assignments	8	10% (10)	Continuous	All
	Projects / Lab.	1	10% (10)	12	LO # 4
	Report	12	10% (10)	Continuous	All
Summative assessment	**Midterm Exam**	2 hr	20% (20)	8	LO # 1-4
	Final Exam	3 hr	60% (60)	15	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
Week 1	الاخلاق..تعريفها لغة واصطلاحا
Week 2	لعمل والمهنة وماهي حدودهما
Week 3	أخلاقيات المهنة، وما هو تعريفها والآراء التي قيلت فيها.
Week 4	القيم واخلاقيات المهنة
Week 5	أنماط السلوك غير الأخلاقي في المهنة
Week 6	وسائل وأساليب ترسيخ أخلاقيات المهنة
Week 7	أخلاقيات مهنة الهندسة

Week 8	ميثاق أخلاقيات مهنة الهندسة لاتحاد المهندسين العرب
Week 9	سلوكيات وأخلاق العمل الهندسي
Week 10	أنماط السلوك غير الأخلاقي في مهندسة الهندسة الكهربائية
Week 11	الفساد الإداري تعريفه وأنواعه
Week 12	علاج الفساد الإداري
Week 13	الرشوة أنواعها والأساليب والدوافع التي تقف وراءها، وكيفية التعامل مع أدواتها من قبل الكادر الهندس
Week 14	الغش في العمل، ومظاهره وكيفية اكتشافه ونتائجه على المهندس وصاحب العمل
Week 15	**الامتحان النهائي**

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	أخلاقيات المهنة مقرر منهجي لطلبة الكليات التقنية ،أعداد ا.م.د.كريم عبد ساجر، أ.م.د رغد حسن حسين، م.د خلود عبد الأمير	Yes
Recommended Texts	أخلاقيات المهنة وقواعد السلوك الوظيفي،أ.د. مازن هادي كزار الطائي	No
Websites	https://www.neelwafurat.com https://studies.aljazeera.ne	

APPENDIX:

GRADING SCHEME
مخطط الدرجات

Group	Grade	التقدير	Marks (%)	Definition
Success Group (50 - 100)	**A** – Excellent	امتياز	90 - 100	Outstanding Performance
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Note:				

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Ministry of Higher Education and
Scientific Research - Iraq
Northern Technical University
Engineering Technical College/Mosul
Department of Electrical Engineering Techniques

MODULE DESCRIPTOR FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	Power system protection			**Module Delivery**	
Module Type	**Core**			✓ **Theory** **Lecture** ✓ **Lab** ☐**Tutorial** ✓ **Practical** ✓ **Seminar**	
Module Code	**EET407**				
ECTS Credits	**6**				
SWL (hr/sem)	***150***				
Module Level		4	**Semester of Delivery**		2
Administering Department		DEPARTMENT OF ELECTRICAL ENGINEERING TECHNIQUES	**College**	**Northern Technical University** **Engineering Technical College/Mosul**	
Module Leader	Noha Abedalbary AbedAljawad		**e-mail**	noha.m.aljwad@ntu.edu.iq	
Module Leader's Acad. Title		Lecturer	**Module Leader's Qualification**		Master
Module Tutor	Name (if available)		**e-mail**	E-mail	
Peer Reviewer Name		Name	**e-mail**	E-mail	
Scientific Committee Approval Date		15/06/2023	**Version Number**		1.0

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

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	1. Students will learn the meaning of protection ,the basic requirements for protection and the parts of the protective system. 2. Students will learn the function of measuring transformer and their characteristic, the importance and the meaning of primary and secondary protection 3. Identify the types of relays and protect the important parts of the power system
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	Important: Write at least 6 Learning Outcomes, better to be equal to the number of study weeks. 1. Meaning and importance of protection and basic requirements for protection. 2. Instrument transformer and their function, back and main protection. 3. Divide the power system in to protective zones. 4. Types of fuses and circuit breakers. 5. Relays their function and types. 6. Protection of generator, transformer, transmission and distribution systems.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. <u>Part A - Protection</u> Definition of Protection, Parts of the protection system, and basic requirements for protection[8hr] Main and Back up protection, Protective zones [8hr] <u>Part B – Protective Relays[12hr]</u> Define relay , their types and function. <u>Part-C- Protection of System equipment</u> [20hr] Protection of Generator, Transmission Lines, Bus Bar, motor

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	1-Conceptual Understanding: Explain protection system, protective zones, primary and Back up protection 2-Mathematical Foundations: Types of Protective Relays 3- Protection of power system equipment's.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	63	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4.2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	87	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	5.8
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**150**		

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

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	What mean of protection, requirements of protection, Basic protection scheme components
Week 2	Instrument transformers (current and voltage transformers)
Week 3	Concept of main and back up protection.
Week 4	What mean by protective zones and its requirments, divide the power system to protective zones,
Week 5	Protective relays and their classification, fuses and circuit breaker.
Week 6	Over current protective Relays.

Week 7	Differential Relays.
Week 8	Distance Relays.
Week 9,10	Protection of power transformer
Week 11	Protection of Transmission and Distribution lines.
Week 12	Protection of generator.
Week 13	Protection of Bus Bar
Week 14	Motor protection
Week 15	Final Examination

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: Current transformer tests.
Week 2	Lab 2: Voltage transformer tests.
Week 3	Lab 3: Simple protection system
Week 4	Lab 4: Thermal over current relay.
Week 5	Lab 5: Inverse-time over current relay
Week 6	Lab 6: Directional relay.
Week 7	Lab 7: Differential relay.
Week 8	Lab 8: Protection of transformer by using differential relay.
Week 9	Lab 9: Lab 1: Introduction to Matlab Simulink.
Week 10	Lab 10: Matlab Simulink for over current relay.
Week 11	Lab 11: Matlab Simulink for differential relay to protect transmission line.
Week 12	Lab 12: Matlab Simulink for differential relay to protect three phase transformer.
Week 13	Lab 13:Matlab Simulink for distance relay.
Week 14	Lab 14: Review
Week 15	

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	A course in Electrical Power, P.v.Gupta 1987	Yes

Recommended Texts	SWITCHGEAR AND PROTECTION, SUNIL S. RAO 1982	No
Websites	https://www.coursera.org/browse/physical-science-and-engineering/electrical-engineering	

Grading Scheme
مخطط الدرجات

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

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

Ministry of Higher Education and Scientific Research - Iraq
Northern Technical University
Engineering Technical College/Mosul
Department of Electrical Technology Engineering

MODULE DESCRIPTOR FORM

نموذج وصف المادة الدراسية

Module Information

معلومات المادة الدراسية

Module Title	STABILITY OF POWER SYSTEM	**Module Delivery**	
Module Type	CORE	✓ **Theory**	
Module Code	EET408	**Lecture**	
ECTS Credits	6	✓ **Lab**	
SWL (hr/sem)	150	**Tutorial**	
		✓ **Practical**	
		✓ **Seminar**	

Module Level	4	**Semester of Delivery**	2
Administering Department	DEPARTMENT OF COMPUTER TECHNIQUES ENGINEERING	**College**	NORTHERN TECHNICAL UNIVERSITY ENGINEERING TECHNICAL COLLEGE/MOSUL
Module Leader	Dr. MAHMOOD TAHA ALKHAYYAT	**e-mail**	m.t.alkhayyat@ntu.edu.iq
Module Leader's Acad. Title	Asst. Prof.	**Module Leader's Qualification**	Ph.D.
Module Tutor	None	**e-mail**	None
Peer Reviewer Name	None	**e-mail**	None
Review Committee Approval	2/06/2023	**Version Number**	1.0

Relation with Other Modules

العلاقة مع المواد الدراسية الأخرى

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

Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

Module Objectives أهداف المادة الدراسية	The module objectives for studying the stability of power systems typically include: 1. Understanding Stability Concepts: Gain a clear understanding of the different stability concepts related to power systems, such as transient stability, steady-state stability, and voltage stability. Learn the definitions, factors affecting stability, and the consequences of instability. 2. Analysing Transient Stability: Study the behaviour of power systems during transient events, such as faults, switching operations, or sudden changes in load conditions. Analyse the transient stability of the system and learn techniques to assess its ability to maintain synchronism and recover from disturbances. 3. Understanding Control and Protection Systems: Explore the role of control and protection systems in maintaining power system stability. 4. Investigating Stability Enhancement Methods: Explore stability enhancement techniques and technologies used in power systems.
Module Learning Outcomes	module learning outcomes suitable for undergraduate electrical engineering students studying the stability of power systems:

مخرجات التعلم للمادة الدراسية	1. Knowledge and Understanding: • Demonstrate a comprehensive understanding of stability concepts and phenomena in power systems, including transient stability, steady-state stability, and voltage stability. • Explain the factors influencing power system stability. • Understand the principles and operation of control and protection systems used to enhance power system stability. 2. Analysis and Evaluation: • Analyse transient stability by assessing the ability of power systems to maintain synchronism during disturbances, such as faults or load changes. • Apply stability analysis techniques, such as equal area criteria. 3. Problem Solving: • Apply stability enhancement methods, such as reactive power compensation, automatic voltage regulation, and power system stabilizers, to address voltage stability problems. 4. Design and Implementation: • Design control and protection systems that enhance power system stability, considering factors such as generator control settings, coordination of protective relays, and deployment of FACTS devices. 5. Communication and Collaboration: • Communicate effectively about power system stability concepts, analysis results, and proposed solutions through written reports, presentations, and discussions.
Indicative Contents المحتويات الإرشادية	Indicative contents for a module on the stability of power systems suitable for undergraduate electrical engineering students: 1. Introduction to Power System Stability: 2. Basic concepts and definitions of stability in power systems 3. Overview of different types of stability: transient, steady-state, and voltage stability 4. Importance of stability for reliable power system operation 5. Transient Stability Analysis: 6. Modelling of synchronous generators, power system components, and loads 7. Transient stability assessment during fault conditions and system disturbances 8. Swing equation and critical clearing time analysis 9. Techniques for analysing and improving transient stability, such as direct methods and equal area criterion 10. Steady-State Stability Analysis: 11. Factors influencing steady-state stability, including load characteristics and system parameters 12. Reactive power control and compensation techniques for improving steady-state stability 13. Identification of critical system modes and their impact on stability 14. Damping improvement techniques and power system stabilizers (PSS) 15. FACTS devices for voltage stability enhancement, such as SVCs and STATCOMs 16. Control and Protection Systems for Stability: 17. Generator control and excitation systems 18. Automatic Voltage Regulators (AVRs) and Power System Stabilizers (PSS) 19. Protective relays and coordination for stability-related events 20. Wide-Area Monitoring Systems (WAMS) and their role in stability monitoring

Learning and Teaching Strategies
استراتيجيات التعلم والتعليم

Strategies

Teaching the stability of power systems to undergraduate students, several learning and teaching strategies can be employed to enhance their understanding and engagement with the subject matter. Here are some strategies suitable for teaching stability of power systems to undergraduate students:

1. Interactive Lectures: Conduct interactive lectures that encourage student participation. Incorporate discussions, questions, and problem-solving exercises throughout the lecture to promote active learning. Encourage students to ask questions and engage in discussions to deepen their understanding.
2. Case Studies and Real-World Examples: Present case studies and real-world examples that illustrate stability issues in power systems. Analyse historical power system failures or major disturbances to highlight the importance of stability analysis and the consequences of instability. This approach helps students relate theoretical concepts to practical applications.
3. Simulation and Visualization Tools: Utilize power system simulation and visualization tools to enhance student learning. Demonstrate power system behaviour during transient events, or stability improvement measures using software tools like MATLAB, or PowerWorld Simulator. This hands-on approach helps students visualize and understand complex stability phenomena.
4. Group Projects and Discussions: Assign group projects or problem-solving exercises that require students to analyse stability-related scenarios and propose solutions. Encourage collaborative learning and group discussions where students can share their findings, insights, and challenges faced during the projects. This promotes teamwork and a deeper understanding of stability concepts.
5. Laboratory Experiments: Conduct laboratory experiments to demonstrate stability-related concepts. Set up simple power system models or emulators to simulate transient stability, or control system behaviour. Students can observe and analyse the effects of various parameters on stability, enhancing their practical understanding.
6. Guest Lectures and Industry Professionals: Invite guest lecturers from the power industry or research institutions to share their experiences and expertise in power system stability. This exposes students to real-world applications, current industry practices, and the challenges faced by professionals in maintaining power system stability.
7. Hands-on Workshops and Software Training: Organize hands-on workshops or training sessions to familiarize students with stability analysis software tools and techniques. Provide step-by-step guidance on using simulation software for stability analysis, allowing students to gain practical skills and confidence in applying stability analysis techniques.
8. Formative Assessments and Feedback: Use formative assessments, such as quizzes, homework assignments, or short exercises, to monitor students' progress and understanding of stability concepts. Provide timely feedback to guide their learning and address any misconceptions or gaps in understanding.
9. Self-Learning Resources: Recommend textbooks, research papers, online tutorials, and resources that students can explore outside the classroom to deepen their understanding of power system stability. Encourage self-learning and independent research to foster a deeper appreciation for the subject matter.
10. Revision and Recap Sessions: Conduct revision and recap sessions before examinations or major assessments to reinforce key concepts and provide a platform for students to clarify doubts and ask questions. Summarize important topics and address common misconceptions to ensure a comprehensive understanding of stability principles.

Student Workload (SWL)
الحمل الدراسي للطالب

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

Module Evaluation
تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	6	10% (10)	5, 10	1, 2, 5
	Assignments	8	10% (10)	2, 12	3, 4,
	Projects / Lab.	9	10% (10)	Continuous	All
	Report	14	10% (10)	13	2, 5
Summative assessment	**Midterm Exam**	2 hr	10% (10)	7	1-4
	Final Exam	3 hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
1	Introduction to Power System Stability • Definition and significance of power system stability • Overview of stability issues and challenges • Classification of stability problems
2	• Swing equation
3	• Modelling of synchronous machines and power system components • Equation of active power flow between two buses
6	• Equal area criterion
7	• Stability during fault clearing
8	• Stability during open circuit breakers
9	• Critical value of rotor angle stability
10, 11	Power System Stability Control • Excitation systems and their role in stability • Power system stabilizers (PSS) and their design • FACTS devices for stability improvement • Control strategies for enhancing stability margins
12	Power frequency control
13, 14	Mitigation Techniques for Stability Enhancement • Load shedding and under-frequency relays • Emergency control and system restoration • Power system stabilizer tuning and adaptive control • Advanced stability control schemes (Wide-Area Monitoring and Control)

15	Final exam

Delivery Plan (Weekly Lab. Syllabus)
المنهاج الاسبوعي للمختبر

	Material Covered
Week 1	Introduction to power world simulator Model design
Week 2	Stability Analysis: learning to input parameters of power system equipments using Power World Simulator's
Week 3	Transient Stability Analysis: Simulate and analyse transient stability events, such as faults or generator tripping, using PowerWorld Simulator's dynamic simulation capabilities. Evaluate the system's ability to maintain stability and recover from disturbances.
Week 4	Rotor angle stability during three phase fault /open circuit breakers/clearing faults
Week 5	Rotor angle stability during single phase fault /open circuit breakers/clearing faults
Week 6	Rotor angle stability during phase- phase fault /open circuit breakers/clearing faults
Week 7	Rotor angle stability during phase- phase ground fault /open circuit breakers/clearing faults
Week 8	Rotor angle stability during three load change /step change /ramp change
Week 9	Voltage stability during three phase fault
Week 10	Voltage stability during asymmetrical fault
Week 11	Frequency response during symmetrical fault
Week 12	Frequency response during asymmetrical fault
Week 13	Stability of multi machines system
Week 14	Review

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	1. J. Duncan Glover, Mulukutla S. Sarma, and Thomas J. Overbye, "Power System Analysis and Design" This widely used textbook covers both the basic principles and advanced topics in power system analysis and design. It includes chapters on power flow, transient stability, and symmetrical components, among others.	Yes
Required Texts	2. Grainger J. J., Stevenson Jr W. D, Power System Analysis	no
Recommended Texts	3. "Power System Analysis" by Hadi Saadat: This comprehensive textbook covers all fundamental aspects of power system analysis, including power flow, fault analysis, stability analysis, and economic dispatch. It provides a solid foundation for understanding power system analysis techniques.	no
Websites	4. "Power System Analysis: Short-Circuit Load Flow and Harmonics" by J.C. Das: This book focuses on the practical aspects of power system analysis, covering topics such as load flow, short-circuit analysis, and harmonic analysis. It	

	includes numerous examples and case studies to help readers understand real-world applications.

APPENDIX:

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

Note:

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

Ministry of Higher Education and
Scientific Research - Iraq
Northern Technical University
Engineering Technical College/Mosul
Department of Electrical Engineering Techniques

MODULE DESCRIPTOR FORM

نموذج وصف المادة الدراسية

Module Information

معلومات المادة الدراسية

Module Title	**HIGH VOLTAGE TECHNIQUES**		
Module Type	CORE	✓ **Theory**	
Module Code	EET409	**Lecture** ✓ **Lab**	
ECTS Credits	5	**Tutorial** ✓ **Practical**	
SWL (hr/sem)	125	✓ **Seminar**	

Module Level	4	**Semester of Delivery**	2
Administering Department	DEPARTMENT OF ELECTRICAL ENGINEERING TECHNIQUES	**College**	NORTHERN TECHNICAL UNIVERSITY ENGINEERING TECHNICAL COLLEGE/MOSUL
Module Leader	Ali N. Hamoodi	**e-mail**	ali_n_hamoodi74@ntu.edu.iq
Module Leader's Acad. Title	Assist.Professor	**Module Leader's Qualification**	Ph.D
Module Tutor	None	**e-mail**	None
Peer Reviewer Name	None	**e-mail**	None
Review Committee Approval	14/06/2023	**Version Number**	1.0

Relation With Other Modules

العلاقة مع المواد الدراسية الأخرى

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

Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

Module Objectives أهداف المادة الدراسية	Objectives of the Course Unit: Students learn about high voltage techniques and the types of insulating materials used in high voltage, also learn the methods of generation, high voltage measuring, testing, cables types which used in high voltage, the effect of over voltages and lightning.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Understanding the principles of high voltage systems and their applications in various industries. 2. Knowledge of safety procedures and regulations in working with high voltage equipment. 3. Ability to troubleshoot and diagnose faults in high voltage systems. 4. Proficiency in the use of specialized tools and equipment used in high voltage maintenance and repair. 5. Familiarity with high voltage testing techniques and procedures. 6. Understanding of the different types of high voltage systems, such as AC and DC systems, and their unique characteristics. 7. Knowledge of electrical insulation materials and their properties. 8. Ability to design and implement high voltage systems for specific applications. 9. Understanding of the effects of high voltage on human beings and the environment.

	10. Knowledge of emerging technologies in high voltage systems and their potential applications.
Indicative Contents المحتويات الإرشادية	1. Introduction to high voltage systems and their applications 2. Electrical safety regulations and procedures 3. High voltage equipment and tools 4. Troubleshooting and fault diagnosis in high voltage systems 5. High voltage testing techniques and procedures 6. AC and DC high voltage systems and their characteristics 7. Electrical insulation materials and properties 8. Design and implementation of high voltage systems 9. Effects of high voltage on human beings and the environment 10. Emerging technologies in high voltage systems

Learning and Teaching Strategies
استراتيجيات التعلم والتعليم

Strategies	1-Simulation Software**:** Use High voltage circuit simulation . 2. High voltage safety protocols and procedures 3. High voltage testing and commissioning 4. High voltage equipment maintenance and repair 5. High voltage emergency response and contingency planning 6. High voltage training and education for personnel 7. High voltage energy efficiency and optimization 8. High voltage grid integration and smart grid technologies 9. High voltage energy storage systems 10. High voltage power electronics and converters 11. High voltage research and development for new technologies and applications

Student Workload (SWL)
الحمل الدراسي للطالب

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	78	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	5.2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	47	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	3.133
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	125		

Module Evaluation
تقييم المادة الدراسية

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

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered

1	Introduction
2	Types of the fields between high voltage electrodes.
3	Insulation materials used in high voltage.
4	Generation of high voltage.
5	High voltage testing.
6	Types of breakdown.
7	Partial discharges.
8	Over voltages.
9	Lightning phenomena.
10	High voltage AC cables.
11	High voltage DC cables.
12	Thermal characteristics and thermal resistance of cables.
13	Heat transfer and cooling of under ground cables.
14	Submarine cables.
15	Final Examination

Delivery Plan (Weekly Lab. Syllabus)
المنهاج الاسبوعي للمختبر

	Material Covered
1	Lab 1:Uniform and non-uniform fields.
2	Lab 2:High voltage AC generation (single step-up transformer and cascade transformer).
3	Lab 3: High voltage DC generation (voltage double, voltage tripper and voltage quadrupler).
4	Lab 4: High voltage impulse generation (Marx circuit).
5	Lab 5: High voltage measurement.
6	Lab 6: High voltage testing.
7	Lab 7: Breakdown in insulators.
8	Lab 8: Partial discharges.
9	Lab 9:Over voltages.
10	Lab 10: Lightning effect.
11	Lab 11: Stress distribution in HVAC cables.
12	Lab 12: Stress distribution in HVDC cables.
13	Lab 13: Thermal effect in HV cables.
14	Lab 14Review.

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	**Available in the Library?**
Required Texts	1. "High Voltage Engineering Fundamentals" by E. Kuffel, W. S. Zaengl, and J. Kuffel 2. "High Voltage Engineering: Theory and Practice" by M. S. Naidu and V. Kamaraju 3. "High Voltage Test Techniques" by Dieter Kind and Wolfgang Köhler 4. "High Voltage Engineering: Fundamentals, Second Edition" by John Kuffel, Peter Kuffel, and Ismail A. Metwally.	Yes

Recommended Texts	High voltage : measurement, testing, and design : Gallagher, T. J -	No
Websites	High Voltage techniques https://archive.org/details/highvoltagemeasu0000gall	

APPENDIX:

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

Note:

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

Ministry of Higher Education and
Scientific Research - Iraq
Northern Technical University
Engineering Technical College/Mosul
Department of Computer Techniques Engineering

MODULE DESCRIPTOR FORM

نموذج وصف المادة الدراسية

Module Information

معلومات المادة الدراسية

Module Title	**PROJECT1**	**Module Delivery**	
Module Type	CORE	**Theory** ✓ **Lecture**	
Module Code	EET410	✓ **Lab** **Tutorial** ✓ **Practical** **Seminar**	
ECTS Credits	5		
SWL (hr/sem)	125		
Module Level	4	**Semester of Delivery**	2
Administering Department	DEPARTMENT OF COMPUTER TECHNIQUES ENGINEERING	**College**	NORTHERN TECHNICAL UNIVERSITY ENGINEERING TECHNICAL COLLEGE/MOSUL
Module Leader	All Acadimic staf	**e-mail**	
Module Leader's Acad. Title		**Module Leader's Qualification**	
Module Tutor	None	**e-mail**	None
Peer Reviewer Name	None	**e-mail**	None
Review Committee Approval	21/06/2023	**Version Number**	1.0

Relation With Other Modules

العلاقة مع المواد الدراسية الأخرى

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

Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

Module Objectives أهداف المادة الدراسية	
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	

Indicative Contents المحتويات الإرشادية	•

Learning and Teaching Strategies
استراتيجيات التعلم والتعليم

Strategies	

Student Workload (SWL)
الحمل الدراسي للطالب

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	93	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	6.2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	32	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	2.1
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	125		

Module Evaluation
تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**				
	Assignments		10% (10)		
	Projects / Lab.	14	15% (10)	Continuous	All
	Report	1	10% (10)	13	LO # 13
Summative assessment	**Midterm Exam**	hr	20% (20)	8	LO # 1 - 86
	Final Exam	hr	50% (50)	15	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
1,2	**Project Selection and Proposal** • Introduction to project selection criteria and guidelines • Identifying a research problem or engineering challenge in biomedical engineering • Formulating a project proposal with clear objectives and scope
3,4,5	**Literature Review and Background Research** • Conducting a comprehensive literature review on the chosen project topic • Evaluating existing research and technologies relevant to the project • Analyzing and synthesizing information to inform the project design
6,7,8,9	**Project Planning and Design** • Developing a detailed project plan with milestones and timelines • Defining project requirements and specifications • Conceptualizing and designing solutions to address the identified problem or challenge
10,11,12, 13,14	**Prototyping and Experimental Work** • Building prototypes or designing experiments to test and validate the proposed solution • Acquiring and assembling necessary components or materials for the project • Conducting experiments, data collection, and measurements as required

Delivery Plan (Weekly Lab. Syllabus)
المنهاج الاسبوعي للمختبر

	Material Covered
	This part varies depending on the subject of the project which is differ from group to group

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts		
Recommended Texts		
Websites		

APPENDIX:

GRADING SCHEME
مخطط الدرجات

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

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Ministry of Higher Education and
Scientific Research - Iraq
Northern Technical University
Engineering Technical College/Mosul
Department of Electrical Engineering Techniques

MODULE DESCRIPTOR FORM
نموذج وصف المادة الدراسية

Module Information
معلومات المادة الدراسية

Module Title	**SUSTAINABLE ENERGY** Elective 2		
Module Type	CORE	✓ **Theory** **Lecture** ✓ **Lab** **Tutorial** ✓ **Practical** ✓ **Seminar**	
Module Code	EET4011		
ECTS Credits	5		
SWL (hr/sem)	136		

Module Level	4	**Semester of Delivery**	2
Administering Department	DEPARTMENT OF ELECTRICAL ENGINEERING TECHNIQUES	**College**	NORTHERN TECHNICAL UNIVERSITY ENGINEERING TECHNICAL COLLEGE/MOSUL
Module Leader	Ali N. Hamoodi	**e-mail**	ali_n_hamoodi74@ntu.edu.iq
Module Leader's Acad. Title	Assist.Professor	**Module Leader's Qualification**	Ph.D
Module Tutor	None	**e-mail**	None
Peer Reviewer Name	None	**e-mail**	None
Review Committee Approval	14/06/2023	**Version Number**	1.0

Relation With Other Modules
العلاقة مع المواد الدراسية الأخرى

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

Module Aims, Learning Outcomes and Indicative Contents
أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

Module Objectives أهداف المادة الدراسية	**To advance economic development, improve energy security, improve access to energy mitigate climate change, reduce Carbon intensity, minimize the impact of the energy sector on the environment from the source to use.**
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Understand the different power generation technologies and their advantages and disadvantages 2. Describe the components and operation of electric power generation, transmission, and distribution systems 3. Analyze the design and operation of power plants, including thermal, nuclear, and renewable energy systems 4. Evaluate the feasibility and modeling of 100% renewable energy solutions 5. Apply power system analysis and design principles to optimize the performance and reliability of power systems 6. Evaluate the design and operation of onshore and offshore wind turbines 7. Analyze the processes and systems involved in solar energy engineering 8. Evaluate the design and operation of microgrids and active distribution networks

	9. Understand the importance of energy storage for sustainable microgrid systems 10. Understand the blockchain ecosystem and its potential applications in sustainable energy systems.
Indicative Contents المحتويات الإرشادية	1. Introduction to sustainable energy and its importance 2. Fossil fuel-based power generation technologies and their environmental impact 3. Renewable energy technologies, including solar, wind, hydro, geothermal, and biomass 4. Energy storage technologies, including batteries, pumped hydro storage, and thermal storage 5. Electric power generation, transmission, and distribution systems and their components 6. Power plant design and operation, including thermal, nuclear, and renewable energy systems 7. 100% renewable energy solutions and their feasibility and modeling 8. Power system analysis and design principles for optimizing performance and reliability 9. Onshore and offshore wind turbine design and operation 10. Solar energy engineering processes and systems 11. Microgrid and active distribution network design and operation 12. Importance of energy storage for sustainable microgrid systems 13. Blockchain ecosystem and its potential applications in sustainable energy systems 14. Government policies and regulations promoting sustainable energy development 15. Case studies of sustainable energy projects and their impact on the environment and society.

Learning and Teaching Strategies
استراتيجيات التعلم والتعليم

Strategies	1. Promoting energy efficiency: This involves reducing energy waste by using energy-efficient appliances, lighting, and insulation to minimize the amount of energy needed to perform tasks. 2. Investing in renewable energy sources: This involves investing in solar, wind, geothermal, and hydroelectric power to generate clean and renewable energy. 3. Encouraging green transportation: This involves promoting the use of electric vehicles and public transport systems that run on clean energy. 4. Implementing carbon capture and storage: This involves capturing carbon dioxide emissions from industrial processes and storing them underground to prevent them from entering the atmosphere. 5. Promoting energy conservation: This involves encouraging individuals and businesses to reduce their energy consumption by turning off lights and appliances when not in use. 6. Developing smart grids: This involves modernizing the electricity grid to improve its efficiency and reliability while integrating renewable energy sources. 7. Encouraging sustainable building practices: This involves promoting the use of sustainable building materials, designs, and construction practices to reduce

	energy consumption in buildings.

Student Workload (SWL)
الحمل الدراسي للطالب

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	78	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	5.2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	47	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	3.1
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	125		

Module Evaluation
تقييم المادة الدراسية

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

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
1	**Introduction and energy fundamentals.**
2	**Carbon accounting.**
3	**Physics of energy.**
4	**Energy accounting.**
5	**Energy supply.**
6	**Energy demand (Industrial and commercial, residential, transportation).**
7	**Renewable energy technology.**
8	**Renewable energy policy.**
9	**Climate science: global energy balance.**
10	**Climate mitigation and policy.**
11	**Global governance of sustainable energy.**
12	**Sustainable energy in economic development.**
13	**System analysis for sustainable energy.**
14	**Sustainable energy finance.**
15	**Final Examination.**

Delivery Plan (Weekly Lab. Syllabus)
المنهاج الاسبوعي للمختبر

	Material Covered
1	Lab 1: Simulation study on solar PV energy system.
2	Lab 2: V-I Characteristics and efficiency of solar PV system.
3	Lab 3: Shadowing effect on solar PV system.
4	Lab 4: Performance assessment of standalone solar power system.

5	Lab 5: Performance assessment of grid connected solar power system.
6	Lab 6: Simulation study on wind energy generator.
7	Lab 7: Performance assessment of micro wind energy generator.
8	Lab 8: Simulation study on hybrid (solar-wind) power system.
9	Lab 9: Simulation study on hydro power.
10	Lab 10: Simulation study on tidal power.
11	Lab 11: Simulation study on geothermal power.
12	Lab 12: Simulation study on biogas plant.
13	Lab 13: Simulation study on fuel cell.
14	Lab 14: Review.

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	1. "The Switch: How Solar, Storage and New Tech Means Cheap Power for All" by Chris Goodall 2. "Drawdown: The Most Comprehensive Plan Ever Proposed to Reverse Global Warming" edited by Paul Hawken 3. "Sustainable Energy - Without the Hot Air" by David MacKay 4. "The Clean Tech Revolution: Discover the Top Trends, Technologies, and Companies to Watch" by Ron Pernick and Clint Wilder 5. "Energy and Civilization: A History" by Vaclav Smil 6. "Renewable Energy: Power for a Sustainable Future" by Godfrey Boyle 7. "The Green New Deal: Why the Fossil Fuel Civilization Will Collapse by 2028, and the Bold Economic Plan to Save Life on Earth" by Jeremy Rifkin 8. "The Energy Bus: 10 Rules to Fuel Your Life, Work, and Team with Positive Energy" by Jon Gordon 9. "The Future of Energy: How the New Oil Industry Will Change People, Politics and Portfolios" by Bill Loveless 10. "Energy Democracy: Advancing Equity in Clean Energy Solutions" edited by Denise Fairchild and Al Weinrub.	Yes
Recommended Texts	Renewable Energy: Power for a Sustainable Future" by Godfrey Boyle	No
Websites	sustainable energy https://books.google.com/books/about/Renewable_Energy.html?id=s9IeAQAAIAAJ	

APPENDIX:

GRADING SCHEME مخطط الدرجات				
Group	**Grade**	التقدير	**Marks (%)**	**Definition**
Success Group (50 - 100)	**A** - Excellent	امتياز	90 - 100	Outstanding Performance
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Ministry of Higher Education and
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Department of Electrical Engineering Techniques

MODULE DESCRIPTOR FORM

نموذج وصف المادة الدراسية

Module Information

معلومات المادة الدراسية

Module Title	**MODERN CONTROL SYSTEM**	**Module Delivery**	
Module Type	CORE	✓ **Theory** **Lecture** ✓ **Lab** **Tutorial** ✓ **Practical** ✓ **Seminar**	
Module Code	EET411		
ECTS Credits	5		
SWL (hr/sem)	125		
Module Level	4	**Semester of Delivery**	2
Administering Department	DEPARTMENT OF ELECTRICAL ENGINEERING TECHNIQUES	**College**	NORTHERN TECHNICAL UNIVERSITY ENGINEERING TECHNICAL COLLEGE/MOSUL
Module Leader	Taha Ahmad Hussein	**e-mail**	taha.hussien@ntu.edu.iq
Module Leader's Acad. Title	Professor	**Module Leader's Qualification**	Master
Module Tutor	None	**e-mail**	None
Peer Reviewer Name	None	**e-mail**	None
Review Committee Approval	14/06/2023	**Version Number**	1.0

Relation With Other Modules

العلاقة مع المواد الدراسية الأخرى

Prerequisite module	EET404	**Semester**	1
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

Module Objectives أهداف المادة الدراسية	This course is an introductory course on linear control systems based on state-space models. The main goal of the course is to provide students with basic tools in modelling , analysis and design for control and estimation . the analysis includes stability , controllability , observability , realization and minimality of the state space model , while the design methods are divided into pole placement for state feedback and observer design, and optimal methods such as linear quadratic regulator , Kalman filter and linear quadratic Gaussian control . students will also learn how to apply the theory to engineering problems with MATLAB.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Learn basic tools in modelling , analysis and design for control and estimation. 2. Analyze stability , controllability , observability Solution of state equation. 3. Analyze realization and minimality of the state space model. 4. Learn pole placement for state feedback and observer design.

	5. Learn how to apply the theory to engineering problems with MATLAB.
Indicative Contents المحتويات الإرشادية	This course will give the basic knowledge for advanced control course such as nonlinear control , robust control , optimal control , adaptive control , digital control , sampled data control , hybrid control and system identification control.

Learning and Teaching Strategies
استراتيجيات التعلم والتعليم

Strategies	1-**Hands-on Experiments:** Engage students in practical experiments to deepen their understanding of control engineering. 2-**Simulation Software:** Use MATLAB simulation software for virtual control design and analysis. 3-**Problem-solving Exercises:** Include various problem-solving exercises to apply control techniques. 4-**Group Projects:** Assign collaborative projects for circuit design and construction. 5-**Real-world Applications:** Discuss practical applications of control theory in different systems. 5-**Interactive Discussions:** Encourage student participation and critical thinking through open-ended questions. 6-**Conceptual Understanding:** Focus on intuitive understanding alongside mathematical analysis. 7-**Assessment Variety:** Use diverse assessment methods to gauge student understanding. 8-**Office Hours and Support:** Offer individualized assistance through office hours or online support.

Student Workload (SWL)
الحمل الدراسي للطالب

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	78	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	5.2
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Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered

1-2	Introduction, state space model, linearization, discretization
3-4	BIBO stability, internal stability, Lyapunov theorem
5-6	Controllability, observability, Kalman decomposition
7-8	Realization, minimal realization
9-10	State feedback control, observer, observer-based control
11-12	Linear quadratic regulator, Kalman filter
13-14	Project presentation, Course summary
15	Final Exam

Delivery Plan (Weekly Lab. Syllabus)
المنهاج الاسبوعي للمختبر

	material covered
1-3	STATE SPACE MODEL, LINEARIZATION, DISCRETIZATION
4-6	BIBO STABILITY, INTERNAL STABILITY, LYAPUNOV THEOREM
7-9	CONTROLLABILITY, OBSERVABILITY, KALMAN DECOMPOSITION
10-12	STATE FEEDBACK CONTROL, OBSERVER, OBSERVER-BASED CONTROL
13-14	LINEAR QUADRATIC REGULATOR, KALMAN FILTER

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	**Available in the Library?**
Required Texts	Linear Systems Theory (2nd Edition) Princeton University Press, 2018, Joao Hespanha	Yes
Recommended Texts	Optimal State Estimation John Wiley & Sons, 2006, Dan Simon	Yes
Websites	Control system engineering https://www.academia.edu/35425584/Control_System_By_Norman_nise	

APPENDIX:

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