Ministry of Higher Education and Scientific Research - Iraq
Northern Technical University
Technical Engineering College
Electronics and Control Engineering Dep.

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	RETE 203				
ECTS Credits	6				
SWL (hr/sem)	150				
Module Level	2		**Semester of Delivery**	4	
Administering Department	RETE		**College**	College of Oil & Gas Techniques Engineering/Kirkuk	
Module Leader			**e-mail**	@ntu.edu.iq	
Module Leader's Acad. Title			**Module Leader's Qualification**		
Module Tutor	None		**e-mail**	None	
Peer Reviewer Name	Asst. Lect.		**e-mail**	@ntu.edu.iq	
Review Committee Approval	01/06/2023		**Version Number**	1.0	

Relation with Other Modules العلاقة مع المواد الدراسية الأخرى

Prerequisite module	Electronics ECE102	**Semester**	Level 1 Semester 2
Co-requisites module	None	**Semester**	

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

Module Aims أهداف المادة الدراسية	Basically, the module aims to establish a strong foundation in electronic circuits, enabling the students to analyze and design basic electronic circuits and understand their applications in various fields such as control systems, telecommunications and consumer electronics. The main module aims are: 1. Understanding fundamental concepts. 2. Developing electronic circuit analysis skills. 3. Familiarity with electronic components. 4. Developing amplifier design skills. 5. Practical circuit design and analysis. 6. Introduction to integrated circuits.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	The module learning outcomes include the following: 1. **Knowledge and Understanding**: Students should demonstrate a solid knowledge and understanding of the fundamental concepts, principles, and theories related to electronic circuits. They should be able to explain the behavior and characteristics of electronic components and their applications in circuit design. 2. **Circuit Analysis Skills**: Students should be able to apply circuit analysis techniques, including Kirchhoff's laws, nodal analysis, and mesh analysis, to solve electronic circuit problems. They should be able to analyze and predict the behavior of circuits under different conditions. 3. **Design and Evaluation**: Students should be able to design and evaluate basic electronic circuits, including amplifiers, using appropriate design principles and techniques. They should understand the trade-offs and considerations involved in circuit design, such as gain, bandwidth, stability, and power efficiency. 4. **Practical Skills**: Students should possess practical skills in building, testing, and troubleshooting electronic circuits. They should be able to use laboratory equipment and tools effectively and safely. They should also demonstrate the ability to analyze and interpret experimental data and draw conclusions based on the results. 5. **Integration of Knowledge**: Students should be able to integrate their knowledge of electronic circuits with other relevant areas, such as mathematics, physics, and computer science. They should be able to apply their knowledge to solve interdisciplinary problems and understand the broader context of electronic circuits in various applications.

	6. **Communication and Presentation Skills**: Students should be able to communicate their ideas, analysis, and design concepts effectively, both orally and in written form. They should be able to present their work and findings in a clear and organized manner, using appropriate technical terminology.
Indicative Contents المحتويات الإرشادية	1. Review of basic concepts: o Diode structure, operation, types and applications. 2. Bipolar Junction Transistors (BJTs): BJT structure, operation, characteristics and biasing techniques. o Field-Effect Transistors (FETs): (JFET and MOSFET) structure, operation, characteristics and biasing techniques. 3. Amplifier configurations: o BJT amplifiers: common emitter, common base, and common collector configurations. o FET amplifiers: common source, common gate, and common drain configurations 4. Amplifier circuits: o BJT small-signal amplifiers: voltage gain, current gain, and power gain. o FET small-signal amplifiers: voltage gain, current gain, and power gain. o Multistage amplifiers and cascaded amplifiers. o Differential amplifiers. 5. Power Amplifiers: o Class A, B, AB, and C power amplifiers Amplifier frequency response and bandwidth: o BJT and FET amplifiers.

	6. Power supply basics: o rectification, filtering, and regulation.
Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	To effectively deliver the electronic circuits module, instructors may employ the following strategies: 1. **Lectures**: Conducting lectures is a traditional method to deliver theoretical concepts and principles. Instructors can use multimedia resources, such as slides, visual aids, and demonstrations, to enhance understanding. They should focus on clear explanations, real-life examples, and engaging students through interactive discussions. 2. **Practical Sessions**: Practical sessions in a laboratory setting are essential for students to apply theoretical knowledge to hands-on circuit design, construction, and testing. Instructors can guide students through experiments and provide opportunities for them to troubleshoot and analyze circuit behavior. This approach reinforces understanding and builds practical skills. 3. **Problem-Solving Exercises**: Assigning problem-solving exercises encourages students to practice circuit analysis techniques and apply theoretical concepts to solve complex problems. Instructors can provide a range of problems at different difficulty levels, offering opportunities for students to work individually or in groups. Feedback and discussions on problem-solving strategies further enhance learning. 4. **Design Projects**: Design projects allow students to integrate their knowledge and skills to design and implement electronic circuits to meet specific requirements. Instructors can assign individual or group projects that involve circuit design, simulation, prototyping, and testing. This approach fosters creativity, critical thinking, and problem-solving abilities. 5. **Simulation Tools**: Using circuit simulation software, such as SPICE (Simulation Program with Integrated Circuit Emphasis), instructors can provide virtual environments for students to design and analyze circuits. Simulations allow students to experiment with different circuit configurations, evaluate performance, and observe behavior in a controlled manner. It also facilitates rapid prototyping and exploration of complex circuits. 6. **Interactive Demonstrations**: Instructors can conduct interactive demonstrations to illustrate the behavior of electronic circuits in real-time.

	These demonstrations can involve circuit construction on a breadboard or using simulation software. By engaging students through live demonstrations, instructors can reinforce concepts and clarify difficult topics. 7. **Group Discussions and Peer Learning**: Encouraging group discussions and peer learning can promote active engagement and knowledge sharing among students. Instructors can assign problem-solving tasks or case studies for group discussions, allowing students to collaborate, exchange ideas, and learn from each other's perspectives and approaches. 8. **Assessment and Feedback**: Assessments, including quizzes, tests, and assignments, are essential for evaluating students' understanding and progress. Instructors should provide timely and constructive feedback to help students identify areas for improvement. Feedback can be provided through individualized comments, grading rubrics, or face-to-face discussions. 9. **Guest Speakers and Industry Visits**: Inviting guest speakers from industry or academia and organizing visits to relevant companies or research labs can provide students with real-world insights and applications of electronic circuits. These opportunities allow students to connect theoretical knowledge with practical applications and gain exposure to industry practices. By incorporating a combination of these strategies, instructors can create an engaging and comprehensive learning experience for students in the electronic circuits module. It is important to adapt and modify these strategies based on the specific needs of the students and the available resources.

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	5	10% (10)	1,3,5,8,11	LO #1, 2, 10,11and 13
	Assignments	5	10% (10)	2, 4,6,10,12	LO # 3, 4, 6,7 and 8
	Projects / Lab.	14	10% (10)	Continuous	
	Report	1	10% (10)	13	LO # 5, 8 and 10
Summative assessment	Midterm Exam	2 hr	10% (10)	7	LO # 1-7
	Final Exam	2hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
Week 1	Review of basic concepts: o Diode structure, operation, types and applications. o Bipolar Junction Transistors (BJTs): BJT structure, operation, characteristics and biasing techniques. o Field-Effect Transistors (FETs): (JFET and MOSFET) structure, operation, characteristics and biasing techniques.
Week 2-3	Amplifier configurations: o BJT amplifiers: common emitter, common base, and common collector configurations. o FET amplifiers: common source, common gate, and common drain configurations
Week 4-7	Amplifier circuits: o BJT small-signal amplifiers: voltage gain, current gain, and power gain. o FET small-signal amplifiers: voltage gain, current gain, and power gain. o Multistage amplifiers and cascaded amplifiers. o Differential amplifiers.

Week 8-10	Power Amplifiers: ○ Class A, B, AB, and C power amplifiers
Week 11-12	Amplifier frequency response and bandwidth: ○ BJT and FET amplifiers.
Week 13-14	Power supply basics: ○ rectification, filtering, and regulation.
Week 15	**Preparatory Week**
Week 16	**Final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	BJT amplifier DC biasing techniques.
Week 2	FET amplifier DC biasing techniques.
Week 3-4	BJT small signal amplifier configurations.
Week 5-6	FET small signal amplifier configurations.
Week 7-8	Multistage amplifiers and cascaded amplifiers.
Week 9	Differential amplifiers.
Week 10	Power Amplifiers: Class A, B, AB, and C power amplifiers
Week 11-12	Bandwidth and frequency response of BJT and FET amplifiers.
Week 13-14	Power supply circuits: rectification, filtering, and regulation.

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

Required Texts	Thomas L. Floyd. 2006. Electric Circuit Fundamentals (7th Edition) (Floyd Electronics Fundamentals Series). Prentice-Hall, Inc., USA.	Yes
Recommended Texts	Adel S. Sedra and Kenneth C. Smith. 2007. Microelectronic Circuits Revised Edition (5th. ed.). Oxford University Press, Inc., USA.	No
Websites	https://www.coursera.org/	

APPENDIX:

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

Note:

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

ملاحظة: هذا النموذج تم وضعه وتقديمه من قبل مديرية ضمان الجودة في وزارة التعليم العالي والبحث العلمي