Northern Technical University
الجامعة التقنية الشمالية

Bachelor of Science (B.Sc.) – Electronics and Control Techniques

البكالوريوس التقني - تقنيات هندسة الالكترونيك والسيطرة

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1. Mission & Vision Statement

Vision Statement

The Department of Electronics and Control Engineering strives to achieve excellence in the field of electronics and control engineering at the local, regional, and global levels, guided by intellectual and professional distinction. It aims to serve the community, contribute to scientific advancement, and participate in the development of technical engineering personnel in the specialized field, in alignment with scientific and economic advancements in the job market.

Mission Statement

Providing high-quality academic programs that align with scientific and technological advancements at the local, regional, and global levels, and actively participating in the development of engineering technologies and continuous improvement of the educational and research system in the college through continuous collaboration with relevant entities in various engineering and technical disciplines.

2. Program Specification

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

The Department of Electronics and Control Engineering was established in 1999 under the name of Electronics and Control Engineering Technologies. It is one of the important departments in the college. The department adopted curriculum materials from prestigious international universities and equipped its laboratories with the latest devices, aiming to train technicians capable of designing various electronic and electrical circuits and dealing with them.

The department approved the commencement of studies in the same year of its establishment and admitted students for the first course. Their curricula were determined based on the needs of industrial facilities. The department takes pride in opening this study program as directed by the Ministry of Higher Education and Scientific Research, in response to enhancing the scientific level by providing advanced technical personnel. The department considers the importance of its study program to be derived from its close connection to the

industry's development in various fields. Therefore, one of the department's objectives is to nurture and follow the scientific and educational trends, develop them to achieve harmony and integration with the scientific and technical activities worldwide, expand and strengthen cooperation with scientific institutions worldwide, encourage scientific missions and promote academic leaves based on the current and future needs of various industrial and research facilities specializing in the field of electronics and control engineering.

The department also aims to introduce information systems in the field of electronics and control engineering to enhance the development of curricula and research methods to meet international standards, stay updated with research and technology advancements worldwide, and continuously supply teaching staff to newly established universities and colleges, especially those with relevant specialization. This is to support faculty members and researchers in those institutions and conduct scientific research aimed at expanding cooperation between universities, serving reconstruction plans, and investing in industrial sectors. Additionally, the department provides direct scientific and technical consultations in specialized centers and advisory offices.

Level 1 exposes students to the fundamentals of electronics, suitable for progression to all programs within the electronics and control program group. Program-specific core topics are covered at Level 2 preparing for specialist modules at Levels 3 and 4. A Leeds electronics graduate is therefore trained to appreciate how research informs teaching, according to the University and College Mission statements.

The research ethos is developed and fostered from the start via practical and lab methods, which are either embedded in lecture modules or taught in dedicated lab modules and tutorials.

Academic tutorials are held at Levels 1 and 2 and 3 with the same tutor, who is also the personal tutor, providing continuity and progressive guidance. Level 1 and 2 tutorials include

a number of workshops to teach skills, e.g. library use and presentation skills, followed by assessed exercises, e.g. essays and talks, as opportunities to practice these skills in a subject-specific context.

International years and Industrial placements are also offered and individual needs are discussed with the appropriate tutor and accommodated wherever possible.

3. Program Goals

The Department of Electronics and Control Engineering aims to:

1. Provide students with the fundamental scientific and engineering concepts in the field of specialization, equipping graduates with the scientific and technical capabilities and competencies necessary for engaging in engineering and technical work and keeping up with the rapid advancements in electronics and control engineering.
2) Foster collaborative research between departments of local, regional, and international universities, strengthening the department's scientific identity.
3) Encourage creativity, innovation, and excellence, and deliver impactful services in various fields.
4) Establish scientific partnerships with similar departments outside of Iraq to stay abreast of contemporary advancements in the educational process, particularly in the engineering and technical fields, benefiting both students and faculty members.
5) Make continuous efforts to improve the performance and quality of the teaching and technical staff in the department.
6) Strive for national accreditation according to the national standards set by the Ministry of Higher Education (General Standards for Technical Diploma and Technical Engineering Programs) and international standards based on ABET's global standards.

7) Develop and accredit laboratories according to good laboratory practice standards.
8) Implement digital transformation in all administrative and scientific processes within the department among its members, as well as with the administrative units in the college.

4. Student Learning Outcomes

Electronics and Control Techniques is the study of the principles and applications of electronic systems and control theory. Graduates obtain knowledge in various aspects of electronics and control and apply this knowledge to solve complex engineering problems. The department offers a Bachelor of Science in Electronics and Control Techniques with concentrations in areas such as Analog Electronics, Digital Electronics, Control Systems, and Communication Systems. Additionally, the department offers courses to students from other disciplines and supports pre-professional programs. The curriculum and experiences in Electronics and Control Techniques are designed to prepare students for careers in industries such as automation, robotics, telecommunications, power systems, and manufacturing, as well as for graduate studies and technical careers.

Outcome 1

A. Knowledge and Understanding

1. Knowledge of Electronics: Students will gain a solid understanding of the principles and theories of electronics, including electronic circuits, devices, and systems.
2. Control Systems: Students will learn about control theory and techniques used in various applications, such as robotics, automation, and industrial processes. They will develop skills in designing, analyzing, and implementing control systems.
3. Analog and Digital Electronics: Students will acquire knowledge and skills in both analog and digital electronics. They will learn about electronic components, circuits, and systems used in various applications.

4. Circuit Design and Analysis: Students will be able to design and analyze electronic circuits using tools and techniques such as circuit simulation software, circuit layout, and troubleshooting.
5. Microcontrollers and Embedded Systems: Students will gain an understanding of microcontrollers, their programming, and interfacing with other electronic components. They will learn how to design and develop embedded systems for various applications.
6. Signal Processing: Students will learn about the processing and analysis of signals, including techniques for filtering, modulation, demodulation, and noise reduction.
7. Communication Systems: Students will understand the principles and technologies involved in communication systems, such as wireless communication, networking protocols, and data transmission.

Outcome 2

Oral and Written Communication

Graduates will be able to formally communicate the results of biological investigations using both oral and written communication skills.

Outcome 3

Laboratory and Field Studies

Students will acquire practical skills through laboratory experiments, which involve working with electronic components, using test and measurement equipment, and troubleshooting circuits and systems.

Outcome 4

Scientific Knowledge

Graduates will be able to demonstrate a balanced concept of how scientific knowledge develops, including the historical development of foundational theories and laws and the nature of science.

Outcome 5

Problem-solving and Analytical Skills

Students will develop problem-solving and analytical skills, allowing them to identify and solve complex engineering problems in the field of electronics and control techniques.

Outcome 6

Critical Thinking

Graduates will be able to use critical-thinking and problem-solving skills to develop a research project and/or paper.

Outcome 7

Subject-specific skills

• The ability to design simple and advanced programs in different programming languages and to control them or through them on electronic and control systems.

• The ability to think and address issues according to their algorithms and methods of work.

• Writing scientific reports, reading charts and analyzing digital data.

5. Academic Staff

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6. Credits, Grading and GPA

Credits

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

Grading

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

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

Calculation of the Grade Point Average (GPA)

1. The GPA is calculated by the summation of each module score multiplied by its ECTS, all are divided by the program total ECTS.

   GPA of a 4-year B.Sc. degrees:

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

7. Curriculum/Modules

First Semester

Semester	No.	Module Code	Module Name in English	اسم المادة الدراسية
One	1	NTU100	Human rights and democracy	حقوق الانسان والديمقراطية
	2	NTU102	Computer Principles	مبادئ الحاسوب
	3	TECK101	Diffirentiation and Integration	التفاضل والتكامل
	4	ECE100	Principles of Electrical Circuits	مبادئ الدوائر الكهربائية
	5	TECK104	Engineering Drawing	الرسم الهندسي
	6	TECK105	Mechanical engineering	الميكانيك الهندسي

Second Semester

Semester	No.	Module Code	Module Name in English	اسم المادة الدراسية
Two	1	NTU101	English Language- Elementary	اللغة الانكليزية الاساسية
	2	ECE102	Electronics	الالكترونيك
	3	ECE103	Workshops	الورش
	4	TECK103	Physics	الفيزياء
	5	ECE104	AC Electrical Circuits	دوائر التيار المتناوب
	6	NTU103	Arabic Language	اللغة العربية

Third Semester

Semester	No.	Module Code	Module Name in English	اسم المادة الدراسية
One	1	ECE200	Mathematics	الرياضيات
	2	ECE201	Electronic Circuits	الدوائر الالكترونية
	3	ECE202	Digital Electronics	الالكترونيك الرقمي
	4	NTU105	Baath Crimes	جرائم البعث
	5	ECE203	Programming Language	لغة برمجة

Fourth Semester

Semester	No.	Module Code	Module Name in English	اسم المادة الدراسية

Two	1	ECE204	Electromagnetic Fields	المجالات الكهرومغناطيسية
	2	ECE205	Measurement Devices	أجهزة القياس
	3	ECE206	Operational Amplifier Circuits	دوائر مضخم العمليات
	4	ECE207	Digital Design Using VHDL	التصميم المنطقي بأستخدام لغة VHDL
	5	NTU200	English Language-intermediate	اللغة الانكليزية - المتوسطة

Fifth Semester

Semester	No.	Module Code	Module Name in English	اسم المادة الدراسية
One	1	ECE301	Engineering Analysis	التحليلات الهندسية
	2	ECE302	Electronic Control	السيطرة الالكترونية
	3	ECE303	Computer Architechure	معمارية الحاسوب
	4	ECE304	Communication Principles	مبادئ الاتصالات

Sixth Semester

Semester	No.	Module Code	Module Name in English	اسم المادة الدراسية
Two	1	ECE305	Power Electronics	الكترونيات القدرة
	2	ECE306	Numerical Analysis	التحليلات العددية
	3	ECE307	Microcontrollers	المسيطرات الدقيقة
	4	ECE308	Digital Communications	الاتصالات الرقمية
	5	ECE309	Controllers theory	نظرية المسيطرات

Seventh Semester

Semester	No.	Module Code	Module Name in English	اسم المادة الدراسية
One	1	ECE400	Digital Control	السيطرة الرقمية
	2	ECE401	Computer Networks	شبكات الحاسوب
	3	ECE402	DC drivers	مسوقات التيار المستمر
	4	ECE403	Automatic control and Robotics	السيطرة الالية والروبوت
	5	TECK400	Research Methodology	منهجية البحث

Eighth Semester

Semester	No.	Module Code	Module Name in English	اسم المادة الدراسية

Two	1	ECE404	AC drivers	مسوقات التيار المتناوب
	2	ECE405	Digital Signal Processing	معالجة الاشارة الرقمية
	3	ECE406	Engineering Economics	الاقتصاد الهندسي
	4	ECE407	Internet of Things	انترنت الاشياء
	5	TECK401	Graduation Project	مشروع التخرج

8. Contact

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Program Coordinator:

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1. Course Name:
Democracy and Human Rights
2. Course Code:
3. Semester / Year:
First Semester / First Year
4. Description Preparation Date:
01-09-2024
5. Available Attendance Forms:
Classroom lectures and study sessions
6. Number of Credit Hours (Total) / Number of Units (Total)
2 hours / 2 units
7. Course administrator's name (mention all, if more than one name)
Name: Dr. Osama Ali Ibrahim Al-Ayimili Email:

8. Course Objectives	
Course Objectives	• Introduce students to human rights and familiarize them with their importance, scope, elements, and the extent of need for them • Shed light on the historical development of human rights in different eras, linking them to contemporary modern fields • Provide students with understanding and awareness of the fundamental principles of human rights • Develop the ability to keep pace with human rights developments
9. Teaching and Learning Strategies	
Strategy	Teaching Methods: • Lectures: Direct lectures, use of audio-visual aids, and modern technology • Interactive Classroom Learning: Classroom participation, expression of ideas, dialogue, and discussion • Interactive Learning: Discussion groups, dialogue, and debate Assessment Methods:

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	2	**Knowledge:** K1 - Understand fundamental	**Chapter One: Conceptual**	**Theoretica lectures,**	**Direct questions**

		human rights concepts, definitions, and basic principles **Skills:** S1 - Identify and categorize different types of human rights **Values:** V1 - Appreciate the universal nature and importance of human dignity	**Framework of Human Rights**	**discussion case studi**	**and oral tests**
2	**2**	**Knowledge:** K1 - Learn about root causes and patterns of human rights violations **Skills:** S1 - Analyze specific cases of human rights violations and their underlying factors **Values:** V2 - Develop awareness of injustice and commitment to preventing violations	**Chapter One: Causes of Human Rights Violations**	**Theoretic lectures, discussion case studi and dialog**	**Direct questions and oral tests**
3	**2**	**Knowledge:** K2 - Explore historical development of human rights in ancient civilizations **Skills:** S2 - Examine historical documents and compare ancient and modern rights concepts **Values:** V1 - Appreciate the evolutionary nature of human rights across cultures and time	**Chapter Two: Human Rights in Mesopotamian Civilization**	**Theoretic lectures, discussion case studi and dialog**	**Direct questions, discussions, and oral tests**
4	**2**	**Knowledge:** K2 - Understand international human rights law and key treaties **Skills:** S2 - Analyze and interpret international human rights documents and declarations **Values:** V2 - Value international cooperation and legal frameworks for protecting rights	**Chapter Three: Rights in International and National Documents**	**Theoretic lectures, discussion case studi and dialog**	**Direct questions and oral tests**

5	**2**	**Knowledge:** K2 - Learn about national constitutions and domestic human rights protections **Skills:** S2 - Compare international standards with national legal frameworks **Values:** V3 - Appreciate the role of national institutions in rights protection	**Chapter Three: Human Rights in National Documents**	**Theoretica lectures, discussion case studi and dialog**	**Direct questions and oral tests**
6	**2**	**Knowledge:** K2 - Understand various mechanisms and institutions for human rights protection **Skills:** S2 - Evaluate the effectiveness of different protection mechanisms **Values:** V3 - Recognize the importance of institutional safeguards and rule of law	**Chapter Four: Means of Protecting Human Rights**	**Theoretica lectures, discussion case studi and dialog**	**Discussions, direct questions, and oral tests**
7	**2**	**Knowledge:** Assessment of K1 and K2 concepts **Skills:** Demonstrate mastery of S1 and S2 analytical abilities **Values:** Show development of V1 and V2 value commitments	**Monthly Examination**	**Examinati**	**Written examination**
8	**2**	**Knowledge:** K3 - Learn the principle of separation of powers and checks and balances **Skills:** S3 - Analyze how separation of powers protects human rights **Values:** V3 - Appreciate democratic governance structures and their importance	**Chapter Four: Principle of Separation of Powers**	**Theoretica lectures, discussion case studi and dialog**	**Direct questions and oral tests**
9	**2**	**Knowledge:** K3 - Understand the role of international	**Chapter Five: International Organizations**	**Theoretica lectures, discussion**	**Direct questions**

		organizations in human rights **Skills:** S3 - Evaluate the effectiveness of international bodies like the UN **Values:** V3 - Value multilateral cooperation and global governance for rights protection	**and Human Rights**	**case studi and dialog**	**and oral tests**
10	**2**	**Knowledge:** K3 - Learn democracy definitions, types, and fundamental characteristics **Skills:** S3 - Compare different democratic models and their features **Values:** V3 - Appreciate democratic values and participatory governance principles	**Chapter Six: Democracy, Definition, and Types**	**Theoretic lectures, discussion case studi and dialog**	**Direct questions and oral tests**
11	**2**	**Knowledge:** K3 - Study various democratic systems practiced globally **Skills:** S3 - Analyze strengths and weaknesses of different democratic systems **Values:** V4 - Understand the diversity of democratic expressions and cultural contexts	**Chapter Seven: Democratic Systems in the World**	**Theoretic lectures, discussion case studi and dialog**	**Discussions and questions**
12	**2**	**Knowledge:** K4 - Understand genocide as the gravest human rights violation **Skills:** S4 - Analyze historical cases of genocide and prevention mechanisms **Values:** V4 - Develop commitment to preventing mass atrocities and protecting vulnerable populations	**Chapter Eight: Crime of Genocide**	**Lectures a group discussion**	**Direct observation**

13	**2**	**Knowledge:** K4 - Learn about civil liberties and classification of fundamental freedoms **Skills:** S4 - Categorize and analyze different types of civil and political rights **Values:** V4 - Appreciate the breadth of human freedoms and their interconnectedness	**Chapter Nine: Concept of Freedoms, Classification of Public Freedoms**	**Lectures a group discussion**	**Discuss ns and questic**
14	**2**	**Knowledge:** K4 - Understand security rights and freedom from fear **Skills:** S4 - Apply human rights principles to contemporary security challenges **Values:** V4 - Balance security needs with human rights protections	**Chapter Ten: Freedom of Security, Peace, and Reassurance**	**Lectures, discussion case studi and dialog**	**Direct observ on and oral te**
15	**2**	**Knowledge:** K4 - Learn about the right to education and its importance for human development **Skills:** S4 - Evaluate educational policies and practices from a rights perspective **Values:** V4 - Advocate for equal access to quality education as a fundamental right	**Chapter Eleven: Freedom of Education**	**Lectures, discussion and synthesis**	**Final assessn nt prepar on**

11.Course Evaluation

The grades:	
Coursework	10
Practical	10
Midterm Exam	30
Final Exam	50
Total	100

12.Learning and Teaching Resources

Required textbooks (curricular books, if any)	Democracy and Human Rights Book 2023 (Curriculum as available)

Main references (sources)	
Recommended books and references (scientific journals, reports...)	
Electronic References, Websites	

1. Course Name:	
Computer Principles	
2. Course Code:	
NTU102	
3. Semester / Year:	
First semester / first stage	
4. Description Preparation Date:	
01-09-2024	
5. Available Attendance Forms:	
(Theoretical and practical lectures)	
6. Number of Credit Hours (Total) / Number of Units (Total)	
1 theoretical + 2 practical / Total hours / 45 Number of units / 2	
7. Course administrator's name (mention all, if more than one name)	
Name: Nyan Farooq Ezzulddin Email: nyan8287@ntu.edu.iq	
8. Course Objectives	
Course Objectives	1. Familiarize yourself with common computer applications and their basic programs. 2. Enhance students' productivity by using computer tools to perform various tasks. 3. Acquire data analysis and visualization skills using computer programs. 4. Develop problem-solving skills using digital tools. 5. Promote digital citizenship and understand the fundamentals of ethical technology use. 6. Prepare students to adapt to new and ever-changing technologies.
9. Teaching and Learning Strategies	
Strategy	Teaching Methods: • Theoretical lectures: To introduce basic concepts, explain computer architecture, and cover the theoretical aspects of computer science principles. • Practical lab work: To enable students to use computer software.

	• Homework: To practice the concepts and principles taught in class. • Peer collaboration: The instructor encourages students to collaborate with each other. Students can work together on projects, share knowledge, and exchange ideas. Assessment Methods: • Assessments: Short quizzes and tests are administered to measure students' mastery of computer science terminology. Students can track their progress and success.

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	**1T**	**If the student successfully completes this course, he will be able to:** **Knowledge**: Understand the basic concepts of computers and the basic concepts of information and communication technology (ICT) and its applications, and classify computer types (personal, desktop, high-speed, embedded). **Skills**: Distinguish between computer types, compare their characteristics, and determine the most appropriate one for each use. **Values**: Understand the importance of computers as an effective tool in supporting various aspects of life.	Introduction to computer characteristics	T	Tests and Reports
	2P	**Knowledge**: Understanding the basic concepts of computers and	Introduction to Computer	P	

		the basic concepts of information and communications technology (ICT) and its applications, and classifying computer types (personal, desktop, high-speed, embedded). **Skills**: Distinguishing between computer types, comparing their characteristics, and determining the most appropriate one for each use. **Values**: Understanding the importance of computers as an effective tool in supporting various aspects of life.			
2-3	**1T**	**Knowledge**: The student will be able to identify the hardware and software components of a computer. **Skills**: Distinguish between input and output units and storage units. **Values**: Awareness of the importance of each component in a computer system. Commitment to maintaining the integrity of hardware components and not tampering with them.	Computer components (hardware and software)	T	Tests and Reports
	2P	**Knowledge**: The student will be able to identify the hardware and software components of a computer. **Skills**: Distinguish between input and output units such as (mouse, keyboard, and printers). **Values**: Awareness of the	Computer components (hardware and software)	P	

		importance of each component in a computer system. Commitment to maintaining the integrity of hardware components and not tampering with them.			
4-6	**1T**	**Knowledge**: Distinguish between graphical user interface elements such as icons, the taskbar, menus, windows, and folders, and learn the basics of common operating systems such as Windows, Linux, and macOS. **Skills**: The operating system is used to navigate between windows and programs efficiently. **Values**: Demonstrates a commitment to organized computer use by clearly organizing files and folders.	Operating Systems and Graphical User Interface (GUI)	T	Tests and Reports
	2P	**Knowledge**: Distinguish between graphical user interface elements such as icons, the taskbar, menus, windows, and folders, and learn the basics of common operating systems such as Windows, Linux, and macOS. **Skills**: The operating system (windows)is used to navigate between windows and programs efficiently. **Values**: Demonstrates a commitment to organized computer use by clearly organizing files and folders.	Operating Systems and Graphical User Interface (GUI)	P	
7	**1T**	**Knowledge**: The student learns about the basic	Midterm exam	T	midterm exam

		components of a computer (central processing unit, memory, input and output units). The difference between software and hardware (Hardware vs. Software) The concept of word processing and the tools used to process it. **Skills**: Operating a computer, using the most common operating system (Windows), using the mouse and keyboard efficiently in a desktop environment, and managing folders and files **Values**: Commitment to accuracy and organization when working on documents and professionalism in document formatting			
	2P	**Knowledge**: The student learns about the basic components of a computer (central processing unit, memory, input and output units). The difference between software and hardware (Hardware vs. Software) The concept of word processing and the tools used to process it. **Skills**: Operating a computer, using the most common operating system (Windows), using the mouse and keyboard efficiently in a desktop environment, and managing folders and files **Values**: Commitment to accuracy and organization	Practical applications + review	P	

		when working on documents and professionalism in document formatting			
8-10	**1T**	**Knowledge**: The student becomes familiar with the components of a word processing program interface such as Microsoft Word. **Skills**: Use word processing software to open and create documents, insert and edit tables within the document, and save the document. **Values**: Accuracy and attention in writing and processing texts.	Word processing	T	Tests and Reports
	2P	**Knowledge**: The student becomes familiar with the components of a word processing program interface such as Microsoft Word. **Skills**: Use word processing software to open and create documents, insert and edit tables within the document, and save the document. **Values**: Accuracy and attention in writing and processing texts.	Word processing	P	
11-13	**1T**	**Knowledge**: Learn about the components of the Microsoft Excel spreadsheet interface. **Skills**: The student will learn how to open Excel files, create new tables, and use mathematical functions to analyze data. **Values**: Methodology and	Spreadsheets	T	Tests and Reports

		organization in arranging data within tables			
	2P	**Knowledge**: Learn about the components of the Microsoft Excel spreadsheet interface. **Skills**: The student will learn how to open Excel files, create new tables, and use mathematical functions to analyze data. **Values**: Methodology and organization in arranging data within tables	Spreadsheets Excel	P	
14	**1T**	**Knowledge**: Understand the concept of emerging technology trends. **Skills**: Distinguish between different types of technical trends based on their use and impact. **Values**: Appreciating the importance of continuous learning in an age of accelerating technology.	Emerging trends and future applications	T	
	2P	**Knowledge**: Understand the concept of emerging technology trends and learn about modern technologies such as AI. **Skills**: Distinguish between different types of technical trends based on their use and impact. **Values**: Appreciating the importance of continuous learning in an age of accelerating technology.	Future trends and applications such as AI	P	
15	**1T**	**Knowledge**: Learn the basic components of a computer, differentiate between hardware and software, learn about the operating system, word processing software, entering data into tables,	Preparatory week	T	Comprehensive review

		applying functions to them, and learn about presentation programs. **Skills**: Able to operate the computer, navigate the operating system, and manage files and folders. **Values**: Responsible for the safe and responsible use of computers and the internet. Accuracy and organization in formatting files, documents, and data entry.			
	2P	**Knowledge**: Learn the basic components of a computer, differentiate between hardware and software, learn about the operating system, word processing software, entering data into tables, applying functions to them, and learn about presentation programs. **Skills**: Able to operate the computer, navigate the operating system, and manage files and folders. **Values**: Responsible for the safe and responsible use of computers and the internet. Accuracy and organization in formatting files, documents, and data	Modern technologies such as artificial intelligence + comprehensive review	P	

11.Course Evaluation

The grades:	
Coursework	10
Practical	10
Midterm Exam	30
Final Exam	50
Total	100

12.Learning and Teaching Resources

Required textbooks (curricular books, if any)	
Main references (sources)	

Recommended books and references (scientific journals, reports...)	"Computer Science Principles: The Foundation Concepts of Computer Science" BY: Mr. Kevin P Hare
Electronic References, Websites	https://edu.gcfglobal.org/en/computers/

1. Course Name:	
English Language 1	
2. Course Code:	
NTU101	
3. Semester / Year:	
First Semester / First Year	
4. Description Preparation Date:	
01-09-2024	
5. Available Attendance Forms:	
6. Number of Credit Hours (Total) / Number of Units (Total)	
2 Hours - 2 Units	
7. Course administrator's name (mention all, if more than one name)	
Name: Email:	
8. Course Objectives	
Course Objectives	• Develop vocabulary and terminology specific to technical fields, enabling students to accurately communicate technical concepts and ideas in English • Improve reading and comprehension skills by enhancing students' ability to read and understand technical texts, manuals, reports, and research papers through effective reading strategies • Enhance writing skills to produce clear and concise technical documents, reports, proposals, and specifications for effective communication in technical contexts • Develop listening and speaking skills in technical settings, enabling students to comprehend technical discussions and participate actively in meetings, presentations, and professional conversations • Cultivate effective communication in professional technical environments, emphasizing clarity, coherence, and appropriate language usage in various communication contexts • Promote cross-cultural communication by developing awareness and understanding of cultural differences in technical communication, enhancing intercultural competence
9. Teaching and Learning Strategies	
Strategy	**Teaching Methods:**

	• **Lectures:** Comprehensive lectures on technical English fundamentals with multimedia presentations and interactive learning materials • **Interactive Learning:** Student participation through role-play activities, group discussions, and technical simulations • **Practical Application:** Hands-on exercises in reading technical texts, writing technical documents, and delivering presentations • **Case Studies:** Analysis of real-world technical communication scenarios and professional contexts **Assessment Methods:** • Continuous assessment through class participation and oral presentations • Writing assignments including technical reports and proposals • Reading comprehension exercises and vocabulary assessments • Mid-term and final examinations on technical English skills

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	**2T**	**Knowledge:** Understand fundamental concepts of technical English and basic grammar tenses **Skills:** Identify and use different tenses correctly in technical contexts **Values:** Appreciate the importance of accurate grammar in technical communication	**Chapter One: Foundations of Technical English - Introduction to Technical English**	**Theoretica lectures, grammar exercises, and practi applicatio**	**Direct questions and oral tests**
2	**2T**	**Knowledge:** Learn reading strategies for technical texts including skimming and scanning **Skills:** Apply reading techniques to comprehend technical articles and	**Chapter One: Reading and Comprehending Technical Texts**	**Theoretica lectures, reading exercises, and comprehe**	**Reading comprehensi on tests and discussions**

		manuals effectively **Values:** Develop appreciation for systematic approaches to technical reading		**on discussion**	
3	**2T**	**Knowledge:** Understand structure and components of technical documents **Skills:** Write clear and concise technical documents with proper organization **Values:** Recognize the importance of clarity and precision in technical writing	**Chapter One: Writing Clear and Concise Technical Documents**	**Theoretica lectures, writing practice, a document analysis**	**Writing assignments and direct assessment**
4	**2T**	**Knowledge:** Learn effective communication techniques for technical contexts **Skills:** Participate actively in technical discussions and role-play activities **Values:** Appreciate the value of effective oral communication in professional settings	**Chapter One: Oral Communication in Technical Contexts**	**Interactiv sessions, role-play activities, and group discussion**	**Oral presentation s and participatio n assessment**
5	**2T**	**Knowledge:** Understand purpose and elements of technical reports and documentation **Skills:** Create well-organized technical reports and documentation **Values:** Develop commitment to accurate and comprehensive technical documentation	**Chapter One: Documentation and Technical Reports**	**Theoretica lectures, report writing practice, a case studie**	**Technical report assignments and evaluation**
6	**2T**	**Knowledge:** Learn techniques for effective technical presentations **Skills:** Deliver clear and engaging presentations on technical topics **Values:** Build confidence in presenting technical	**Chapter One: Presenting Technical Information**	**Presentati skills training, practice sessions, a peer feedback**	**Individual presentation s and peer evaluation Written examination**

		information to diverse audiences			
7	**2T**	**Knowledge:** Understand cultural differences in technical communication **Skills:** Apply cross-cultural communication strategies effectively **Values:** Develop cultural sensitivity in international technical environments	**Chapter Two: Cross-Cultural Communication in Technical Settings**	**Theoretica lectures, c studies, an cultural analysis discussion**	**Cultural awareness exercises and discussions**
8	**2T**	**Knowledge:** Consolidate language skills and concepts from previous weeks **Skills:** Apply review and revision techniques to improve technical communication **Values:** Appreciate the importance of continuous improvement in language skills	**Chapter Two: Review and Revision**	**Review sessions, revision exercises, and consolidat activities**	**Review assignments and skill demonstrati ons**
9	**2T**	**Knowledge:** Focus on specific grammar structures relevant to technical communication **Skills:** Apply advanced grammar and language skills in technical contexts **Values:** Recognize the importance of grammatical accuracy in professional communication	**Chapter Two: Grammar and Language Focus**	**Grammar lessons, practice exercises, and applicatio activities**	**Grammar tests and practical applications**
10	**2T**	**Knowledge:** Expand technical vocabulary through targeted exercises **Skills:** Use broader technical vocabulary appropriately in various contexts **Values:** Develop commitment to continuous vocabulary development	**Chapter Two: Technical Vocabulary Expansion**	**Vocabular building activities, word usag practice, a field-speci terminolo**	**Vocabulary tests and usage assessments**

11	**2T**	**Knowledge:** Understand structure and components of technical proposals **Skills:** Write comprehensive technical proposals for specific projects **Values:** Appreciate the importance of persuasive and clear proposal writing	**Chapter Two: Writing Technical Proposals**	**Proposal writing instructio practice sessions, a project-based learning**	**Technical proposal assignments and evaluation**
12	**2T**	**Knowledge:** Learn techniques for creating effective technical documentation **Skills:** Develop comprehensive technical documentation ensuring accuracy and usability **Values:** Understand the critical role of documentation in technical fields	**Chapter Three: Effective Technical Documentation**	**Document on techniques practical exercises, and usabil testing**	**Documentat ion projects and quality assessment**
13	**2T**	**Knowledge:** Prepare for comprehensive assessment of technical English skills **Skills:** Demonstrate readiness for final evaluation **Values:** Commit to continued development of technical English proficiency	**Preparatory Week**	**Review sessions, individual consultati , and exan preparati**	**Final assessn nt prepar on**
14	**2T**	**Knowledge:** Understand fundamental concepts of technical English and basic grammar tenses **Skills:** Identify and use different tenses correctly in technical contexts **Values:** Appreciate the importance of accurate grammar in technical communication	**Chapter One: Foundations of Technical English - Introduction to Technical English**	**Theoretica lectures, grammar exercises, and practi applicatio**	**Direct questio and or tests**
15	**2T**	**Knowledge:** Prepare for comprehensive assessment of technical English skills	**Preparatory Week**	**Review sessions, individual**	**Final assessment preparation**

		Skills: Demonstrate readiness for final evaluation **Values:** Commit to continued development of technical English proficiency		**consultatic , and exan preparatic**	

11.Course Evaluation

The grades:	
Coursework	10
Practical	10
Midterm Exam	30
Final Exam	50
Total	100

12.Learning and Teaching Resources

Required textbooks (curricular books, if any)	English for Technical Communication by K.R. Lakshminarayanan (2015 Edition)
Main references (sources)	
Recommended books and references (scientific journals, reports...)	
Electronic References, Websites	

1. Course Name:	
Differentiation and Integration	
2. Course Code:	
TECK101	
3. Semester / Year:	
First Semester / Second Academic Year	
4. Description Preparation Date:	
01-09-2024	
5. Available Attendance Forms:	
Weekly (Theoretical and Practical Lectures)	
6. Number of Credit Hours (Total) / Number of Units (Total)	
Theory2 / Total: 2	
7. Course administrator's name (mention all, if more than one name)	
Name: Name: Asst. Lecturer Marwa Khaleel Hassan Email: Email: marwa.khaleel@ntu.edu.iq	
8. Course Objectives	
Course Objectives	• The mathematics course aims to provide students with essential knowledge and skills, enabling them to develop equation-solving abilities and use mathematical tools to analyze problems in the fields of science, engineering, and economics.
9. Teaching and Learning Strategies	
Strategy	• **Theoretical lectures**: To achieve cognitive learning objectives. • **Discussions and dialogues**: To enhance understanding and develop analytical thinking. • **Utilizing general engineering principles**: To illustrate the application of mathematics in system design and analysis.

10. Course Structure					
Week	**Hours**	**Required Learning Outcomes**	**Unit or subject name**	**Learning method**	**Evaluation method**
1-2	**2T**	**If the student successfully completes this course, he will be able to:** **Knowledge**: Identify the concept and properties of determinants, compute determinants of degree *n*, and understand Cramer's rule for solving linear equations. **Skills**: Apply Cramer's rule to solve systems of linear equations and use determinants in solving mathematical and engineering problems. **Values**: Promote accuracy and discipline in mathematical problem-solving steps, and develop logical thinking in dealing with equation.	Determinants and Their Properties – Determinants of Degree *n* – Solving Linear Equations Using Cramer's Rule – Applications of Determinants.	T	Tests and Reports
3-4	**2T**	**Knowledge:** Understand the basic concepts of trigonometric functions and their relationships, how to graph them, and know their applications in engineering fields, triangles, and solving various problems. **Skills:** Accurately plot trigonometric function curves, apply trigonometric identities to	Trigonometric Functions – Trigonometric Identities and Graphing of Functions – Geometric and Trigonometric Applications – Various Applications of Trigonometric Functions.	T	Tests and Reports

		solve equations and problems, and calculate geometric quantities using trigonometric functions. **Values:** Appreciate the importance of trigonometric functions in describing periodic phenomena and geometric concepts, develop accuracy in calculations and graphing, and enhance the ability to solve applied problems.			
5-6	**2T**	**Knowledge:** Understand the concept of vectors in two- and three-dimensional space, perform vector operations (addition, subtraction, dot product, and cross product), comprehend unit vectors and vector magnitude, and their applications in finding areas, projections, and mechanics. **Skills:** Accurately perform vector calculations, determine unit vectors and magnitudes, compute dot and cross products, calculate areas using vectors, and solve applied mechanical problems involving vectors. **Values:** Appreciate the importance of vectors as a mathematical tool to describe physical quantities, develop spatial	Vectors – Vector Operations in Two- and Three-Dimensional Space – Orthogonal Unit Vectors – Vector Magnitude – Dot Product, Cross Product, and Projections – Calculating Area Using Vectors – Mechanical Applications of Vectors.	T	Tests and Reports

		thinking and the ability to visualize dimensions, and enhance precision and logical reasoning in solving engineering and mechanical problems.			
7-8	**2T**	**Knowledge:** Understand the concept of functions and limits, grasp methods for calculating limits of algebraic and trigonometric functions, know how to handle limits at infinity, and recognize applications of limits. **Skills:** Accurately compute limits of various functions, apply limit rules to solve problems, analyze function behavior as it approaches specific values or infinity, and solve applied problems based on the concept of limits. **Values:** Appreciate the fundamental role of limits in calculus, develop analytical thinking to understand function behavior, and enhance accuracy and logical reasoning in solving mathematical problems.	Function and Limit – Limits – Limits of Algebraic and Trigonometric Functions and the Limit of a Function as it Approaches Infinity – Applications of Limits.	T	Tests and Reports
9	**2T**	**Knowledge:** Comprehend and recall the mathematical concepts studied during the first half of the semester, and	Midterm Exam	T	Final Exam

		correctly apply the related rules and theorems. **Skills:** Solve complex problems under time pressure, identify appropriate methods to tackle different types of problems, and apply acquired concepts in new contexts. **Values:** Appreciate the importance of regular review and thorough preparation, develop self-discipline in studying, and boost confidence in academic performance.			
10-11 12	**2T**	**Knowledge:** Understand the theory of derivatives, the concepts of composite, implicit, and inverse functions, how to differentiate algebraic and trigonometric functions, grasp the chain rule, and comprehend applications of derivatives in mechanics and inverse trigonometric functions. **Skills:** Skillfully apply various differentiation rules (composite, implicit, inverse functions), use the chain rule to solve complex differentiation problems, and solve physical and mechanical problems using derivatives.	Derivative Theory – Composite Functions – Derivatives of Algebraic, Trigonometric, and Implicit Functions – Standard Functions – Chain Rule – Mechanical Applications of Derivatives – Inverse Functions – Derivatives of Inverse Trigonometric Functions – Various Applications.	T	Tests and Reports

		Values: Appreciate the power of calculus in describing changes and natural phenomena, develop accuracy in computational and analytical processes, and strengthen the connection between mathematical concepts and their practical applications in engineering and physics.			
13-14	**2T**	**Knowledge:** Understand the derivatives of logarithmic, exponential, and hyperbolic functions, the identities and graphs of hyperbolic functions and their inverses, and their applications in physics and mechanics. **Skills:** Skillfully differentiate logarithmic, exponential, hyperbolic functions and their inverses, graph hyperbolic functions and interpret their relationships, and apply these concepts to solve physical and mechanical problems. **Values:** Appreciate the diversity and power of differential tools, develop precision in handling advanced functions, and strengthen the connection between mathematics and its scientific and engineering applications.	Derivatives of Logarithmic and Exponential Functions – Hyperbolic Functions – Derivatives of Hyperbolic and Inverse Hyperbolic Functions – Identities, Graphs, and Inverses of Hyperbolic Functions – Applications in Physics and Mechanics.	T	Tests and Reports

15	**2T**	**Knowledge:** Comprehend the basic concepts and review previously studied essential mathematical topics, and become familiar with the course syllabus and its objectives. **Skills:** Recall and apply foundational mathematical skills, identify personal strengths and weaknesses in core subjects, and develop effective study habits for the new course. **Values:** Appreciate the importance of mathematical fundamentals, cultivate self-discipline in study preparation, and build confidence to succeed in the course.	Preparatory Week		T	Comprehensive Review

11.Course Evaluation

The grades:	
Coursework	10
Practical	10
Midterm Exam	30
Final Exam	50
Total	100

12.Learning and Teaching Resources

Required textbooks (curricular books, if any)	"CALCULUS", by George. B. Thomas. "Engineering Mathematics", by John Bird.
Main references (sources)	
Recommended books and references (scientific journals, reports...)	
Electronic References, Websites	

1. Course Name:
Engineering drawing
2. Course Code:
TECK103
3. Semester / Year:
First semester / First stage
4. Description Preparation Date:
2024
5. Available Attendance Forms:
Weekly (theoretical and practical lectures) - Mandatory
6. Number of Credit Hours (Total) / Number of Units (Total)
125 total hours / 2 credit units (1 theoretical + 2 practical) hour
7. Course administrator's name (mention all, if more than one name)
Name: Nabeel Muhamed Akram Samad Email: nabeelakram@ntu.edu.iq
8. Course Objectives

Course Objectives	1- Develop vocabulary and terminology: Expand students' technical vocabulary and scientific and practical terminology specific to their field of study or profession, enabling them to communicate technical concepts and ideas accurately. 2- Improving work skills in engineering drawing: enhancing students' ability to draw electronic maps, for the purpose of applying them in electronic device factories. 3 - Developing technical skills: enhancing students' work skills in factories, enabling them to understand the mechanism of work and participating in activities to raise the scientific level.

	4- Develop effective communication: Enhance students' ability to communicate effectively in professional technical environments, with an emphasis on clarity, coherence, and appropriate use of engineering drawing in industrial business contexts. 5- Enhancing students' competencies in engineering drawing: Developing students' skills and enhancing their competency in order to gain them skills in the field of manufacturing and engineering.

9. Teaching and Learning Strategies

Strategy	Teaching Methods: • Theoretical lectures: to achieve cognitive objectives • Practical laboratory applications: for curriculum components to achieve skills • Dialogues and discussions: during theoretical and practical lectures to achieve • Using general engineering principles: for analyzing and designing engineering problems • Application of programming principles and rules: for programmable control systems design Assessment Methods: • Theoretical examinations: periodic and semester exams to verify (A1-A4) • Practical examinations: periodic and semester exams to verify (B1-B4) • Short tests (Quizzes): continuous assessment • Classroom dialogues and discussions: to verify (A1-A2) • Assignments (Homework's): practical applications • Classroom result presentations: for discussion and student participation

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	3	**Knowledge**: Understands basic engineering drawing concepts, including	Introduction to AutoCAD • Explore the AutoCAD interface and tools	Theoretical + Practical	Tests and exercises

		command types and their properties. **Skills**: Develops the ability to program geometric shapes and apply them to a calculator. **Values**: Enhances accuracy and discipline in analyzing measurements and engineering calculations for drawing.	• Set up your workspace and modules • Understand basic drawing and editing commands		
2	3	**Knowledge**: Understands basic engineering drawing concepts, including command types and their properties. **Skills**: Develops the ability to program geometric shapes and apply them to a calculator. **Values**: Enhances accuracy and discipline in analyzing measurements and engineering calculations for drawing.	Engineering Construction Techniques • Introduction to Cartesian Coordinates • Two-dimensional shapes and their representation in coordinates	Theoretical + Practical	Tests and exercises
3	3	**Knowledge**: Understands basic engineering drawing concepts, including command types and their properties.	Drawing Command • Point Representation • Lines in a Decatrical Style • Angular Lines Types of Lines	Theoretical + Practical	Tests and exercises

		Skills: Develops the ability to program geometric shapes and apply them to a calculator. **Values**: Enhances accuracy and discipline in analyzing measurements and engineering calculations for drawing			
4	**3**	**Know**ledge: Understands basic engineering drawing concepts, including command types and their properties. Skills: Develops the ability to program geometric shapes and apply them to a calculator. Values: Enhances accuracy and discipline in analyzing measurements and engineering calculations for drawing	Drawing Command • Methods for drawing a circle • Tangent, perpendicular, and parallel relationships Drawing Command • Methods for drawing arcs	Theoretical + Practical	Tests and exercises

5	**3**	**Knowledge**: Understands basic engineering drawing concepts, including command types and their properties. **Skills**: Develops the ability to program geometric shapes and apply them to a calculator. **Values**: Enhances accuracy and discipline in analyzing measurements and engineering calculations for drawing	Drawing command • Arc drawing methods	Theoretical + Practical	Tests and exercises
6	3	**Knowledge**: Understands basic engineering drawing concepts, including command types and their properties. **Skills**: Develops the ability to program geometric shapes and apply them to a calculator. **Values**: Enhances accuracy and discipline in analyzing measurements and engineering calculations for drawing	Drawing Commands • Rectangular and Polygon Drawing Methods • Dimensions and Measurement Explanation	Theoretical + Practical	Tests and exercises
7	3	**Know**ledge: Understands basic engineering drawing	Midterm exam	Theoretical + Practical	midterm exam

		concepts, including command types and their properties. Skills: Develops the ability to program geometric shapes and apply them to a calculator. Values: Enhances accuracy and discipline in analyzing measurements and engineering calculations for drawing			
8	3	**Know**ledge: Understands basic engineering drawing concepts, including command types and their properties. Skills: Develops the ability to program geometric shapes and apply them to a calculator. Values: Enhances accuracy and discipline in analyzing measurements and engineering calculations for drawing	A Drawing Commands • Methods for drawing rectangles and polygons • Dimensions and explanation of measurements	Theoretical + Practical	Tests and exercises
9	3	**Know**ledge: Understands basic engineering drawing	Modify command • Resize command • Move command	Theoretical + Practical	Tests and exercises

		concepts, including command types and their properties. Skills: Develops the ability to program geometric shapes and apply them to a calculator. Values: Enhances accuracy and discipline in analyzing measurements and engineering calculations for drawing	• Copy command		
10	**3**	**Know**ledge: Understands basic engineering drawing concepts, including command types and their properties. Skills: Develops the ability to program geometric shapes and apply them to a calculator. Values: Enhances accuracy and discipline in analyzing measurements and engineering calculations for drawing	Modification Pass • Crop Command • Shade Command • Erase Command	Theoretical + Practical	Tests and exercises
11	3	**Know**ledge: Understands basic engineering drawing concepts, including	Modify Commands • Displace Command • Reflect Command • Explode Command	Theoretical + Practical	Tests and exercises

		command types and their properties. Skills: Develops the ability to program geometric shapes and apply them to a calculator. Values: Enhances accuracy and discipline in analyzing measurements and engineering calculations for drawing	• Boundary Command		
12	3	**Know**ledge: Understands basic engineering drawing concepts, including command types and their properties. Skills: Develops the ability to program geometric shapes and apply them to a calculator. Values: Enhances accuracy and discipline in analyzing measurements and engineering calculations for drawing	Modify Commands • Displace Command • Reflect Command • Explode Command • Boundary Command	Theoretical + Practical	Tests and exercises
13	3	**Know**ledge: Understands basic engineering drawing concepts, including	Modify Commands • Matrix Command • Stretch Command • Rotate Command • Scale Command	Theoretical + Practical	Tests and exercises

		command types and their properties. Skills: Develops the ability to program geometric shapes and apply them to a calculator. Values: Enhances accuracy and discipline in analyzing measurements and engineering calculations for drawing			
14	3	**Know**ledge: Understands basic engineering drawing concepts, including command types and their properties. Skills: Develops the ability to program geometric shapes and apply them to a calculator. Values: Enhances accuracy and discipline in analyzing measurements and engineering calculations for drawing	Modification Commands • Matrix Command • Stretch Command • Rotate Command • Scale Command	Theoretical + Practical	Tests and exercises
15	3	**Know**ledge: Understands basic engineering drawing concepts, including		Theoretical + Practical	Comprehensive review

		command types and their properties. Skills: Develops the ability to program geometric shapes and apply them to a calculator. Values: Enhances accuracy and discipline in analyzing measurements and engineering calculations for drawing	Comprehensive review		
16	3	**Know**ledge: Understands basic engineering drawing concepts, including command types and their properties. Skills: Develops the ability to program geometric shapes and apply them to a calculator. Values: Enhances accuracy and discipline in analyzing measurements and engineering calculations for drawing	Final exam	Theoretical + Practical	Final exam

11.Course Evaluation

The grades:	
Coursework	20
Practical	20

Midterm Exam	10
Final Exam	50
Total	100

12.Learning and Teaching Resources

Required textbooks (curricular books, if any)	
Main references (sources)	
Recommended books and references (scientific journals, reports...)	
Electronic References, Websites	https://www.youtube.com/watch?v=lA334HiOuA

1. Course Name:	
Workshops (electronics + electrical)	
2. Course Code:	
ECE105	
3. Semester / Year:	
Second semester / First Stage	
4. Description Preparation Date:	
1-9-2024	
5. Available Attendance Forms:	
Weekly (theoretical and practical lectures) - Mandatory	
6. Number of Credit Hours (Total) / Number of Units (Total)	
3 practical/hour 150 Number of units 1/	
7. Course administrator's name (mention all, if more than one name)	
Name: Nabeel Muhamed Akram Samad Email: nabeelakram@ntu.edu.iq	
8. Course Objectives	
Course Objectives	1. Vocabulary and Terminology Development: Expanding students' technical vocabulary and the scientific and practical terms specific to their field of study or profession, enabling them to accurately communicate technical concepts and ideas. 2. Improving Workshop Skills: Enhancing students' practical skills for practical application in real-life situations. 3. Developing Technical Skills: Enhancing students' laboratory skills, enabling them to understand the work process and participate in activities to raise academic standards. 4. Developing Effective Communication: Enhancing students' ability to communicate effectively in professional technical environments, with a focus on clarity, coherence, and the appropriate use of work tools in various business contexts. 5. Enhancing Students' Competencies in Electronics and Electrical Workshops: Developing students' skills and enhancing their competence for success in daily life.
9. Teaching and Learning Strategies	
Strategy	Teaching Methods:

	• Theoretical lectures: to achieve cognitive objectives • Practical laboratory applications: for curriculum components to achieve skills • Dialogues and discussions: during theoretical and practical lectures to achieve • Using general engineering principles: for analyzing and designing engineering problems • Application of programming principles and rules: for programmable control systems design

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	3	1. Knowledge of Qualifying Workshops: Students will gain a solid understanding of workshops, including their applications and student roles. 2. Application of Qualifying Workshops to Projects: Students will be able to apply scientific knowledge to real-world projects, demonstrating their ability to design and implement specific requirements. 3. Workshop Analysis and Optimization: Students should be able to identify and calibrate equipment to improve performance and apply optimization techniques to improve these performance.	Training Workshop Concepts • Occupational Safety • Components and Contents of Training Workshops • Determining Measuring Devices	Theoretical + Practical	Tests and exercises

2	3	1. Knowledge of Qualifying Workshops: Students will gain a solid understanding of workshops, including their applications and student roles. 2. Application of Qualifying Workshops to Projects: Students will be able to apply scientific knowledge to real-world projects, demonstrating their ability to design and implement specific requirements. 3. Workshop Analysis and Optimization: Students should be able to identify and calibrate equipment to improve performance and apply optimization techniques to improve these performance.	Semiconductors • Introduction to semiconductor alloys. • Types of semiconductor elements. • Factors affecting semiconductor alloys.	Theoretical + Practical	Tests and exercises
3	3	1. Knowledge of Qualifying Workshops: Students will gain a solid understanding of workshops, including their applications and student roles. 2. Application of Qualifying	Resistance • Definition of resistance. • Reading resistance by color. • Types of resistors. • Uses and applications of resistors	Theoretical + Practical	Tests and exercises

		Workshops to Projects: Students will be able to apply scientific knowledge to real-world projects, demonstrating their ability to design and implement specific requirements. 3. Workshop Analysis and Optimization: Students should be able to identify and calibrate equipment to improve performance and apply optimization techniques to improve these performance.			
4	**3**	1. Knowledge of Qualifying Workshops: Students will gain a solid understanding of workshops, including their applications and student roles. 2. Application of Qualifying Workshops to Projects: Students will be able to apply scientific knowledge to real-world projects, demonstrating their ability to design and implement specific requirements. 3. Workshop Analysis and Optimization:	Capacitor • Definition of a capacitor. • Types of capacitors. • Factors affecting capacitors. • Reading capacitors. • Their uses in electronic circuits.	Theoretical + Practical	Tests and exercises

		Students should be able to identify and calibrate equipment to improve performance and apply optimization techniques to improve these performance.			
5	**3**	1. Knowledge of Qualifying Workshops: Students will gain a solid understanding of workshops, including their applications and student roles. 2. Application of Qualifying Workshops to Projects: Students will be able to apply scientific knowledge to real-world projects, demonstrating their ability to design and implement specific requirements. 3. Workshop Analysis and Optimization: Students should be able to identify and calibrate equipment to improve performance and apply optimization techniques to improve these performance.	Diode • Definition, components, and characteristics of a diode. • Types of diodes. • Diode testing. • Uses of diodes	Theoretical + Practical	Tests and exercises

6	3	1. Knowledge of Qualifying Workshops: Students will gain a solid understanding of workshops, including their applications and student roles. 2. Application of Qualifying Workshops to Projects: Students will be able to apply scientific knowledge to real-world projects, demonstrating their ability to design and implement specific requirements. 3. Workshop Analysis and Optimization: Students should be able to identify and calibrate equipment to improve performance and apply optimization techniques to improve these performance.	Transistor • Definition of an ester transistor and its components. • Types of transistors. • Examination of an ester transistor. • Uses of an ester transistor	Theoretical + Practical	Tests and exercises
7	3	1. Knowledge of Qualifying Workshops: Students will gain a solid understanding of workshops, including their applications and student roles. 2. Application of Qualifying Workshops to	Rayleigh Family • Definition of Rayleigh • Parts and Types of Rails • How a Relay Works • Uses of Rayleigh	Theoretical + Practical	Tests and exercises

		Projects: Students will be able to apply scientific knowledge to real-world projects, demonstrating their ability to design and implement specific requirements. 3. Workshop Analysis and Optimization: Students should be able to identify and calibrate equipment to improve performance and apply optimization techniques to improve these performance.			
8	3	1. Knowledge of Qualifying Workshops: Students will gain a solid understanding of workshops, including their applications and student roles. 2. Application of Qualifying Workshops to Projects: Students will be able to apply scientific knowledge to real-world projects, demonstrating their ability to design and implement specific requirements. 3. Workshop Analysis and Optimization:	Welding • Introduction to welding and its types. • Welding elements and requirements. • Element processing and welding requirements. • Welding steps • Welding removal	Theoretical + Practical	Tests and exercises

		Students should be able to identify and calibrate equipment to improve performance and apply optimization techniques to improve these performance.			
9	3	1. Knowledge of Qualifying Workshops: Students will gain a solid understanding of workshops, including their applications and student roles. 2. Application of Qualifying Workshops to Projects: Students will be able to apply scientific knowledge to real-world projects, demonstrating their ability to design and implement specific requirements. 3. Workshop Analysis and Optimization: Students should be able to identify and calibrate equipment to improve performance and apply optimization techniques to improve these performance.	Design a simple circuit • Understand how an electronic circuit works. • Trace the signal according to the circuit diagram to understand the function of each component. • Solder the electronic components according to the circuit diagram.	Theoretical + Practical	Tests and exercises
10	**3**	1. Knowledge of Qualifying	Workshop Safety Procedures	Theoretical + Practical	Tests and exercises

		Workshops: Students will gain a solid understanding of workshops, including their applications and student roles. 2. Application of Qualifying Workshops to Projects: Students will be able to apply scientific knowledge to real-world projects, demonstrating their ability to design and implement specific requirements. 3. Workshop Analysis and Optimization: Students should be able to identify and calibrate equipment to improve performance and apply optimization techniques to improve these performance.	• Principles of Electrophysiology • Methods of Electrical Injury • Types of Electrical Injuries • Prevention of Electrical Hazards		
11	3	1. Knowledge of Qualifying Workshops: Students will gain a solid understanding of workshops, including their applications and student roles. 2. Application of Qualifying Workshops to Projects: Students will be able to apply scientific knowledge	Electricity • Introduction to National Electricity • Methods of generating electricity through power plants • Occupational safety for high-voltage electricity	Theoretical + Practical	Tests and exercises

		to real-world projects, demonstrating their ability to design and implement specific requirements. 3. Workshop Analysis and Optimization: Students should be able to identify and calibrate equipment to improve performance and apply optimization techniques to improve these performance.			
12	3	1. Knowledge of Qualifying Workshops: Students will gain a solid understanding of workshops, including their applications and student roles. 2. Application of Qualifying Workshops to Projects: Students will be able to apply scientific knowledge to real-world projects, demonstrating their ability to design and implement specific requirements. 3. Workshop Analysis and Optimization: Students should be able to identify and calibrate equipment	Electrical Supply • Types of Power Transmission Lines • Electricity Distribution from the Grid to Residential Areas • Types of Foundation Cables for Homes • Types of Outdoor Transformers in the Area • Home Electricity Connection and Connection Type: Single-Phase or Three-Phase	Theoretical + Practical	Tests and exercises

		to improve performance and apply optimization techniques to improve these performance.			
13	3	1. Knowledge of Qualifying Workshops: Students will gain a solid understanding of workshops, including their applications and student roles. 2. Application of Qualifying Workshops to Projects: Students will be able to apply scientific knowledge to real-world projects, demonstrating their ability to design and implement specific requirements. 3. Workshop Analysis and Optimization: Students should be able to identify and calibrate equipment to improve performance and apply optimization techniques to improve these performance.	Applications for some electrical circuits and household wiring • A single-switch electrical circuit using a lamp • Installing a ladder switch using a lamp • Installing a circuit breaker and protection devices • Circuiting the doorbell	Theoretical + Practical	Tests and exercises
14	3	1. Knowledge of Qualifying Workshops: Students will gain a solid understanding of	Measuring Devices • Multimeter • How to Connect a Multimeter	Theoretical + Practical	Tests and exercises

		workshops, including their applications and student roles. 2. Application of Qualifying Workshops to Projects: Students will be able to apply scientific knowledge to real-world projects, demonstrating their ability to design and implement specific requirements. 3. Workshop Analysis and Optimization: Students should be able to identify and calibrate equipment to improve performance and apply optimization techniques to improve performance.			
15	3	1. Knowledge of Qualifying Workshops: Students will gain a solid understanding of workshops, including their applications and student roles. 2. Application of Qualifying Workshops to Projects: Students will be able to apply scientific knowledge to real-world projects,	Generators and Motors • Types of Generators and Motors • Components of a Single-Phase Motor	Theoretical + Practical	Comprehensive review

		demonstrating their ability to design and implement specific requirements. 3. Workshop Analysis and Optimization: Students should be able to identify and calibrate equipment to improve performance and apply optimization techniques to improve these performance.			
16	3	1. Knowledge of Qualifying Workshops: Students will gain a solid understanding of workshops, including their applications and student roles. 2. Application of Qualifying Workshops to Projects: Students will be able to apply scientific knowledge to real-world projects, demonstrating their ability to design and implement specific requirements. 3. Workshop Analysis and Optimization: Students should be able to identify and calibrate equipment to improve performance and	Final exam	Theoretical + Practical	Final exam

		apply optimization techniques to improve performance.			

11.Course Evaluation	
The grades:	
Coursework	20
Practical	20
Report and design	10
Final Exam	50
Total	100

12.Learning and Teaching Resources	
Required textbooks (curricular books, if any)	• Practical electronics workshop equipment • Electrical installation design and inspection Electrical circuit principles
Main references (sources)	
Recommended books and references (scientific journals, reports...)	
Electronic References, Websites	https://www.et3lemdelivery.com/2018/11/Electr y-Basics-Workshop-pdf.html

1. Course Name:
Math 2
2. Course Code:
TECK102
3. Semester / Year:
First Semester / Second Year
4. Description Preparation Date:
01-09-2024
5. Available Attendance Forms:
Weekly (Theoretical and Practical Lectures)
6. Number of Credit Hours (Total) / Number of Units (Total)
Theory2 / Total: 2
7. Course administrator's name (mention all, if more than one name)
Name: Name: Asst. Lecturer Marwa Khaleel Hassan Email: Email: marwa.khaleel@ntu.edu.iq
8. Course Objectives

Course Objectives	• The mathematics course aims to provide students with essential knowledge and skills, enabling them to develop equation-solving abilities and use mathematical tools to analyze problems in the fields of science, engineering, and economics.
9. Teaching and Learning Strategies	
Strategy	• **Theoretical lectures**: To achieve cognitive learning objectives. • **Discussions and dialogues**: To enhance understanding and develop analytical thinking.

	• **Utilizing general engineering principles**: To illustrate the application of mathematics in system design and analysis.

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1-2	**2T**	**If the student successfully completes this course, he will be able to:** **Knowledge:** Understand the theory of integration, distinguish between definite and indefinite integrals, know how to integrate trigonometric, inverse, exponential, logarithmic, and hyperbolic functions, and how to use L'Hôpital's rule in integration. **Skills:** Apply various integration techniques to accurately compute definite and indefinite integrals, integrate diverse types of functions, and use L'Hôpital's rule to solve complex integrals. **Values:** Appreciate the importance of integration as a tool for calculating areas and volumes, develop accuracy in computational and analytical processes, and enhance the ability to solve complex	Integration – Integration Theory – Definite and Indefinite Integrals – Integration of Trigonometric and Inverse Functions – Integration of Exponential and Logarithmic Functions – Integration of Hyperbolic and Inverse Hyperbolic Functions – Integration Using L'Hôpital's Rule.	T	Tests and Reports

		mathematical problems methodically.			
3	**2T**	**Knowledge:** Understand the concept of integration by parts as one of the fundamental integration methods, including when and how to apply it to solve specific types of integrals. **Skills:** Skillfully apply the integration by parts formula to solve integrals involving the product of two functions, and correctly choose the functions uuu and dvdvdv to simplify the process. **Values:** Appreciate the importance of flexibility in selecting appropriate methods for solving integral problems, cultivate patience and accuracy in lengthy calculations, and enhance the ability to analyze complex function structures.	Integration Techniques – Integration by Parts.	T	Tests and Reports
4	**2T**	**Knowledge:** Understand the method of integration by partial fractions and grasp the mechanical applications of vectors. **Skills:** Apply the partial fractions method to solve integration problems and	Integration by Partial Fractions – Mechanical Applications of Vectors.	T	Tests and Reports

		use vectors to solve mechanical problems. **Values:** Appreciate the effectiveness of advanced integration methods, develop accuracy in solving mechanical problems, and strengthen the connection between algebra and physical applications.			
5	**2T**	**Knowledge:** Understand the principle of integration by trigonometric substitution, identify cases that require its use, and know the appropriate trigonometric substitutions for different types of integrals. **Skills:** Effectively apply the trigonometric substitution method to solve integrals containing specific radical expressions, transforming them into simpler forms that can be solved. **Values:** Appreciate flexibility in solving integration problems, develop algebraic and trigonometric transformation skills, and enhance confidence in handling advanced integration techniques.	Integration by Trigonometric Substitution.	T	Tests and Reports

6	**2T**	**Knowledge:** Understand the method of completing the square in integration and know how to use appropriate substitutions (assumptions) to solve complex integrals. **Skills:** Successfully apply the completing the square technique to transform integrals and select the correct substitutions to effectively solve various integrals. **Values:** Appreciate flexibility and creativity in integration methods, develop accuracy in algebraic manipulations, and enhance analytical thinking skills for solving mathematical problems.	Integration by Completing the Square and by Substitution	T	Tests and Reports
7	**2T**	**Knowledge:** Comprehensively understand and apply the mathematical concepts studied throughout the entire semester, demonstrating deep mastery of the syllabus. **Skills:** Efficiently solve a wide range of complex and detailed problems under time pressure, integrate and apply acquired knowledge and skills to tackle new challenges. **Values:** Appreciate the importance of	Midterm Exam	T	Final Exam

		perseverance and thorough review, develop self-discipline in learning and preparation, and boost confidence in academic abilities within the subject.			
8	**2T**	**Knowledge:** Understand how to use integration to solve physical problems (such as work and energy) and engineering problems (such as areas, volumes, and centers of mass). **Skills:** Apply integration to accurately calculate physical and engineering quantities, and translate real-world problems into solvable integral models. **Values:** Appreciate the role of integration as a powerful tool for solving applied problems, develop analytical thinking skills, and strengthen the connection between mathematical concepts and the real world.	Physical and Engineering Applications of Integration	T	Tests and Reports
9	**2T**	**Knowledge:** Understand the concept of area calculation using integration, and how to find the area bounded between a curve and the x-axis, or between two different curves. **Skills:** Accurately apply definite integrals to calculate areas, correctly	Area Under a Curve and Between Curves	T	Tests and Reports

		determine the limits of integration, and graph curves to identify the required area region. **Values:** Appreciate the importance of integration as a tool for solving geometric and applied problems, develop precision in mathematical calculations, and enhance visual and analytical thinking for complex regions.			
10-11	**2T**	**Knowledge:** Understand the concepts of volumes of revolution and methods to calculate them, as well as how to determine the arc length of a curve using integration. **Skills:** Calculate volumes of solids generated by rotating plane regions, and determine arc lengths of various curves using integration techniques. **Values:** Appreciate the role of integration in computing complex geometric quantities, develop accuracy in applying mathematical formulas, and enhance the ability to visualize three-dimensional shapes.	Volumes of Revolution – Arc Length of a Curve	T	Tests and Reports
12	**2T**	**Knowledge:** Understand the concept of simple differential equations,	Simple Differential Equations	T	Tests and Reports

		their types, and basic methods of solving them. **Skills:** Solve simple differential equations using appropriate methods, and determine the general and particular solutions for given problems. **Values:** Appreciate the importance of differential equations in modeling natural phenomena, develop logical thinking in analyzing changes, and enhance accuracy in finding solutions.			
13-14	**2T**	**Knowledge:** Understand the principles of area estimation using the Trapezoidal and Simpson's rules, and grasp the concept of numerical integration methods and their applications. **Skills:** Accurately apply the Trapezoidal and Simpson's rules to approximate integrals, use numerical methods to practically solve integration problems, and analyze and interpret the results of approximate integrations. **Values:** Appreciate the importance of numerical methods in solving mathematical problems that cannot be addressed	Approximate Area Using the Trapezoidal and Simpson's Rules – Numerical Integration Methods – Applications.	T	Tests and Reports

		analytically, develop precision in approximate calculations, and enhance the ability to apply mathematics in practical contexts.			
15	**2T**	**Knowledge:** Comprehend the basic concepts and review the necessary mathematical prerequisites for the course, and become familiar with the study plan and its objectives. **Skills:** Recall and apply foundational mathematical skills, assess current knowledge levels, and develop effective study strategies. **Values:** Appreciate the importance of a solid knowledge foundation, cultivate commitment to thorough preparation, and enhance self-confidence to successfully start the course.	Preparatory Week	T	Comprehensive Review

11.Course Evaluation	
The grades:	
Coursework	10
Practical	10

Midterm Exam	30
Final Exam	50
Total	100

12.Learning and Teaching Resources

Required textbooks (curricular books, if any)	"CALCULUS", by George. B. Thomas. "Engineering Mathematics", by John Bird.
Main references (sources)	
Recommended books and references (scientific journals, reports...)	
Electronic References, Websites	

1. Course Name:	
Mechanical engineering	
2. Course Code:	
ECE101	
3. Semester / Year:	
First semester / First year	
4. Description Preparation Date:	
01-09-2024	
5. Available Attendance Forms:	
Weekly (theoretical lectures) - Mandatory	
6. Number of Credit Hours (Total) / Number of Units (Total)	
3 hours each week / 3 credit	
7. Course administrator's name (mention all, if more than one name)	
Name: Yahya Ghufran Khidhir Email: yahhya.khidhir24@ntu.edu.iq	
8. Course Objectives	
Course Objectives	• **Introduce Fundamental Concepts of Mechanics:** Equip students with a strong foundation in the basic principles of statics, dynamics, and the mechanics of materials, essential for understanding the behavior of physical systems in engineering contexts. • **Develop Problem-Solving Skills:** Enable students to apply mechanical principles, such as equilibrium, force analysis, and motion, to model and solve real-world engineering problems logically and effectively. • **Bridge Theory with Engineering Applications:** Foster the ability to connect theoretical mechanics with practical applications in mechanical systems, preparing students for advanced courses and multidisciplinary problem-solving in future engineering practice.
9. Teaching and Learning Strategies	
Strategy	Teaching Methods: • Theoretical lectures: to achieve cognitive objectives • Dialogues and discussions: during theoretical and practical lectures to achieve

	• Using general engineering principles: for analyzing and designing engineering problems Assessment Methods: • Daily written and oral tests, applied tests, seminars, semester and final exams, assignments, attendance and commitment, feedback (testing the student on the previous subject), self-evaluation (questions are set for the student by the teacher and the student. • Theoretical examinations: periodic and semester exams to verify (A1-A5) • Practical examinations: periodic and semester exams to verify (B1-B5) • Short tests (Quizzes): continuous assessment • Classroom dialogues and discussions: to verify (A1-A2) • Assignments (Homework's): practical applications • Classroom result presentations: for discussion and student participation

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	**3T**	**If the student successfully completes this course, he will be able to:** **Knowledge:** Understands the scope, importance, and applications of engineering mechanics in various engineering disciplines. **Skills:** Identifies and categorizes mechanical problems into statics or dynamics; interprets engineering terminology and symbols.	Introduction to Engineering Mechanics	T	Tests and Reports

		Values: Develops curiosity and appreciation for the foundational role of mechanics in engineering design and innovation.			
2	**3T**	**Knowledge**: Understands the principles of force systems and conditions for static equilibrium. **Skills**: Solves equilibrium problems using free-body diagrams and vector analysis. **Values**: Encourages logical reasoning and precision in solving real-world equilibrium problems.	Forces and Equilibrium	T	Tests and Reports
3	**3T**	**Knowledge:** Recognizes the characteristics of two-dimensional force systems and their components. **Skills:** Resolves coplanar force systems graphically and analytically. **Values:** Promotes systematic analysis and attention to detail in force resolution.	Coplanar Force Systems	T	Tests and Reports
4	**3T**	**Knowledge:** Understands the concept and physical meaning of distributed loads in mechanical systems. **Skills:** Calculates resultants of distributed loads on beams and surfaces.	Distributed Forces	T	Tests and Reports

		Values: Emphasizes accuracy and thoroughness in dealing with continuous systems.			
5	**3T**	**Knowledge:** Understands the classification and behavior of structures under load. **Skills:** Applies methods of joints and sections to analyze trusses and frames. **Values:** Encourages teamwork and responsibility in structural analysis tasks.	Analysis of Structures	T	Tests and Reports
6	**3T**	**Knowledge:** Understands the laws of dry friction and its role in mechanical equilibrium. **Skills:** Analyzes equilibrium problems involving frictional forces on inclined planes and wedges. **Values:** Promotes realism in engineering design by considering frictional effects.	Friction	T	Tests and Reports
7	**3T**	**Knowledge:** Ability to recall and explain core concepts and laws of mechanics **Skills:** Proficiency in solving static equilibrium	Mid-term Exam	T	Tests and Reports

		problems and analyzing simple structures **Values:** Demonstration of analytical discipline, accuracy, and clear logical reasoning			
8	**3T**	**Knowledge**: Understands the concept of moments, couples, and their applications. **Skills**: Calculates moments about a point or axis and simplifies force-couple systems. **Values**: Cultivates critical thinking in evaluating mechanical systems' torque and balance.	Moments and Couples	T	Tests and Reports
9	**3T**	**Knowledge:** Understands equilibrium conditions for two- and three-dimensional rigid bodies. **Skills**: Constructs accurate free-body diagrams and solves static problems for rigid bodies. **Values**: Instills responsibility and rigor in developing reliable mechanical designs.	Equilibrium of Rigid Bodies	T	Tests and Reports

10	**3T**	**Knowledge:** Understands loading types (point, distributed, and moment) and shear/moment relationships. **Skills:** Constructs shear force and bending moment diagrams for statically determinate beams. **Values:** Promotes diligence and care in interpreting structural responses to loading.	Distributed Forces in Beams	T	Tests and Reports
11	**3T**	**Knowledge:** Understands fluid pressure distribution on submerged surfaces and the concept of center of pressure. **Skills:** Calculates hydrostatic forces and centers of pressure on plane surfaces. **Values:** Encourages ethical responsibility in designing fluid-containing systems.	Center of Pressure and Hydrostatics	T	Tests and Reports
12	**3T**	**Knowledge:** Understands the definition and significance of area and mass moments of inertia. **Skills:** Computes moments of inertia for composite shapes and	Moments of Inertia	T	Tests and Reports

		uses parallel axis theorem. **Values:** Promotes accuracy and conceptual clarity in dynamic and structural analysis.			
13	**3T**	**Knowledge:** Understands the principle of virtual work and its application in structural systems. **Skills:** Applies virtual work to solve statically indeterminate trusses and verify static results. **Values:** Encourages analytical efficiency and appreciation for alternative solution methods.	Virtual Work and Trusses	T	
14	**3T**	**Knowledge:** Understands internal loadings such as shear, bending moment, and axial force. **Skills:** Determines internal forces in structural members through sectioning methods. **Values:** Reinforces the importance of structural integrity and safety in engineering practice.	Internal Forces in Beams and Frames	T	

15	**3T**	**Knowledge:** Understands the conditions and vector principles governing 3D equilibrium. **Skills:** Analyzes spatial force systems and solves 3D equilibrium problems. **Values:** Promotes spatial reasoning and attention to comprehensive analysis in complex systems.	Three-Dimensional Equilibrium	T	

11.Course Evaluation

The grades:	
Quizzes	10
Projects	10
Online assignments	10
Reports	10
Midterm Exam	10
Final Exam	50
Total	100

12.Learning and Teaching Resources

Required textbooks (curricular books, if any)	statics and DYNAMICS ENGINEERING MECHANICS Fourteenth EDITION Authors: R. C. HIBBELER
Main references (sources)	
Recommended books and references (scientific journals, reports...)	Mechanics of Materials Authors: R.C. Hibbeler
Electronic References, Websites	Mechanics of Materials Authors: R.C. Hibbeler URL: https://www.youtube.com/playlist?list=PLPLlcV 9fXj-jVczLmF44fkjoh6hY-1Q1

1. Course Name:	
Principles of Electrical Circuits1	
2. Course Code:	
ECE100	
3. Semester / Year:	
First Semester / First Year	
4. Description Preparation Date:	
01-09-2024	
5. Available Attendance Forms:	
Weekly (theoretical and practical lectures) - Mandatory	
6. Number of Credit Hours (Total) / Number of Units (Total)	
90 / 4 credit units	
7. Course administrator's name (mention all, if more than one name)	
Name: Roaya S. Abdalrahman Email: rouya.abdalrahman@ntu.edu.iq	
8. Course Objectives	
Course Objectives	• Understand the fundamental concepts of electrical circuits, including voltage, current, resistance, and power. • Apply Ohm's Law and Kirchhoff's Laws to analyze simple DC and AC circuits. • Develop the ability to solve series, parallel, and series-parallel circuit configurations. • Analyze and interpret circuit behavior using basic theorems such as Thevenin's and Norton's theorems. • Gain practical skills in measuring electrical quantities using standard laboratory instruments.
9. Teaching and Learning Strategies	
Strategy	Teaching Methods: • Theoretical lectures: to achieve cognitive objectives • Practical laboratory applications: for curriculum components to achieve skills • Dialogues and discussions: during theoretical and practical lectures to achieve Assessment Methods: • Theoretical examinations: periodic and semester exams to verify (A1-A4) • Practical examinations: periodic and semester exams to verify (B1-B4)

	• Short tests (Quizzes): continuous assessment • Classroom dialogues and discussions: to verify (A1-A2) • Assignments (Homework's): practical applications • Classroom result presentations: for discussion and student participation.

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	3**T**	**If the student successfully completes this course, he will be able to:** **Knowledge**: Understand the importance and applications of electrical circuits **Skills**: Identify course structure and learning expectations **Values**: Develop scientific curiosity and commitment to learning	Introduction to electrical circuits	T	Tests and Reports
	3**P**	**Knowledge**: Understand the types and functions of measuring instruments (voltmeter, ammeter, ohmmeter, multimeter) **Skills**: Properly use and connect measuring devices in electrical circuits **Values**:Accuracy, safety awareness, and responsibility in the lab	Identifying Measuring Devices	P	
2	3**T**	**Knowledge**: Understand SI units and unit conversions in electrical engineering **Skills**: Perform unit conversions accurately **Values**: Attention to detail and precision	Systems of Units	T	Tests and Reports

	3**P**	**Knowledge**: Learn how to read resistor values using color codes **Skills**: Identify resistance values practically from physical resistors **Values**: Attention to detail and visual analysis	Standard Resistor Color Code Measurement	P	
3	3**T**	**Knowledge**: Understand the concepts of electric charge and current **Skills**: Calculate electric charge and current in simple situations **Values**: Foster scientific inquiry and analytical thinking	Charge and Current	T	Tests and Reports
	3**P**	**Knowledge**: Understand the relationship between voltage, current, and resistance **Skills**:Build a simple circuit and measure current and voltage to verify Ohm's Law **Values**: Logical problem-solving and adherence to procedures	– Ohm's Law Practical Verification	P	
4	3**T**	**Knowledge**: Understand the definition of voltage and its relation to energy and charge **Skills**: Calculate voltage difference between two points **Values**: Build logical thinking and concept linking	Voltage	T	Tests and Reports
	3**P**	**Knowledge**: Learn how series connection affects total resistance **Skills**: Construct and test a series circuit; measure current and voltage	Resistors in Series	P	

		Values: Cooperation and responsibility during circuit construction			
5	3**T**	**Knowledge**: Understand the relationship between power, voltage, and current **Skills**: Calculate energy consumption or generation in circuits **Values**: Appreciate energy efficiency and responsible usage	Power and Energy	T	Tests and Reports
	3**P**	**Knowledge**:Understand how parallel connection affects total resistance **Skills**: Build and analyze a parallel circuit using real components **Values**: Comparing results and critical thinking	Resistors in Parallel	P	
6	3**T**	**Knowledge**: Learn the relationship between voltage, current, and resistance **Skills**: Apply Ohm's Law to solve simple circuit problems **Values**:Develop logical and sequential problem-solving skills	Ohm's Law	T	Tests and Reports
	3**P**	**Knowledge**: Learn why and when to use Δ-to-Y transformation in circuits **Skills**: Apply transformation equations in a practical setup **Values**:Patience, precision in measurements	Delta to Star (Δ-(Y Transformation	P	
7	3**T**	**Knowledge**: Identify the components and structure of electric circuits **Skills**: Distinguish between nodes, branches, and loops **Values**:Enhance circuit	Nodes, Branches, and Loops	T	Tests and Reports

		organization and analysis abilities			
	3**P**	**Knowledge**:Understand the reverse transformation and its applications **Skills**: Perform Y-to-Δ conversion and test results **Values**:Improve analytical thinking and confidence in solving	Star to Delta (Y-Δ) Transformation	P	
8	3**T**	**Knowledge**: Understand the principle of current conservation at nodes **Skills**: Apply KCL to analyze simple circuits **Values**:Encourage collaboration in solving circuit problems	Kirchhoff's Current Law (KCL)	T	Tests and Reports
	3**P**	**Knowledge**: Understand Kirchhoff's Current and Voltage Laws **Skills**: Apply KCL and KVL in multi-branch circuits **Values**:Reinforce theory with hands-on practice and teamwork	Kirchhoff's Laws – Practical Application	P	
9	3**T**	**Knowledge**: Understand the principle of voltage conservation in loops **Skills**: Apply KVL to analyze voltage in closed loops **Values**:Foster accuracy and analytical concentration	Kirchhoff's Voltage Law (KVL)	T	Tests and Reports
	3**P**	**Knowledge**: Learn how to simplify a circuit to a single voltage source and resistance **Skills**: Find Thevenin equivalent practically and verify results **Values**:Promote abstraction and equivalent modeling	Thevenin's Theorem	P	

10	3**T**	**Knowledge**: Integrate KCL and KVL in more complex circuit analysis **Skills**: Solve multi-path and mixed-source circuits **Values**:Promote perseverance and persistence in problem solving	Applications of Kirchhoff's Laws	T	Tests and Reports
	3**P**	**Knowledge**: Understand Norton's equivalent circuit and its relation to Thevenin's **Skills**: Find Norton equivalent circuit practically **Values**:Deepen understanding of circuit simplification	Norton's Theorem	P	
11	3**T**	**Knowledge**: Reinforce understanding of previous concepts **Skills**: Solve review problems and exercises **Values**:Build confidence in self-assessment and understanding	General Review and Exercises	T	Tests and Reports
	3**P**	**Knowledge**: Analyze circuits with multiple sources **Skills**: Isolate sources and measure resulting currents or voltages **Values**:Step-by-step problem-solving and precision	Superposition Theorem	P	
12	3**T**	**Knowledge**: Evaluate accumulated knowledge and understanding **Skills**: Manage time and accuracy during test analysis **Values**:Respect academic integrity and fair assessment	Midterm Exam / Review	T	Tests and Reports

	3**P**	**Knowledge**: Understand how to analyze circuits based on node voltages **Skills**: Write and solve node voltage equations using measurements **Values**:Enhance accuracy and structured thinking	Nodal Analysis	P	
13	3**T**	**Knowledge**: Analyze series, parallel, and combination circuits **Skills**: Apply circuit laws to solve mixed circuits **Values**:Enhance critical thinking and interpretation	Series, Parallel, and Mixed Circuits	T	
	3**P**	**Knowledge**: Consolidate all previously learned practical concepts **Skills**: Perform integrated experiments combining multiple **Values**:Develop critical evaluation and troubleshooting skills	General Review of Previous Labs	P	
14	3**T**	**Knowledge**: Integrate and connect all course topics coherently **Skills**: Solve sample final exam problems **Values**:Prepare mentally and organizationally for the exam	Final Review	T	
	3**P**	**Knowledge**: Demonstrate mastery of all lab concepts **Skills**: Build and analyze a comprehensive circuit using learned methods **Values**:Independence, discipline, and performance under pressure	Final Practical Exam / Project	P	
15	3**T**	**Knowledge**: Demonstrate mastery of course learning outcomes **Skills**: Apply all acquired skills in a comprehensive	Final Exam	T	

		test **Values**:Show responsibility and integrity in evaluation			
	3**P**	**Knowledge**: Summarize key practical outcomes; discuss results **Skills**: Reflect on learning, common errors, and strengths **Values**:Accept constructive feedback and value self-assessment	Lab & Conclusion Evaluation	P	

11.Course Evaluation

The grades:

Coursework	10
Practical	10
Midterm Exam	30
Final Exam	50
Total	100

12.Learning and Teaching Resources

Required textbooks (curricular books, if any)	● Fundamentals of Electric Circuits by Charle .K. Alexander | Matthew N. O. Sadiku (5th ● Introductory Circuit Analysis (10th ed.) by .Robert L. Boylestad ● Principles of Electric Circuits Conventional Current Version by Thomas L. Floyd (Ninth .(Edition
Main references (sources)	● Introduction to Circuit Analysis and Desig .by Tildon H. Glisson, Jr
Recommended books and references (scientific journals, reports...)	
Electronic References, Websites	· Website: https://www.multisim.com · Description: Professional-grade circuit simulation tool by National Instruments. A free online version is available for basic use.

1. Course Name:
Alternating Current Circuit
2. Course Code:
ECE 103
3. Semester / Year:
Second Semester / First Year
4. Description Preparation Date:
20/06/2025
5. Available Attendance Forms:
Weekly (theoretical and practical lectures) - Mandatory
6. Number of Credit Hours (Total) / Number of Units (Total)
290hr
7. Course administrator's name (mention all, if more than one name)
Name: Haitham Hashim Abbas Email: haithamhashim7@ntu.edu.iq
8. Course Objectives

Course Objectives	1. Understanding AC Fundamentals: Gain a solid understanding of the basic concepts and principles of AC electricity, including voltage, current, power, frequency, phase, and waveforms. 2. Analyzing AC Circuits: Learn techniques to analyze AC circuits using mathematical tools such as phasors, complex numbers, impedance, admittance, and reactance. 3. Circuit Components: Study various components used in AC circuits, such as resistors, capacitors, and inductors, and learn how these components behave in AC circuits. 4. Circuit Analysis Techniques: Develop skills in applying different methods and techniques to analyze AC circuits, including Kirchhoff's laws, mesh analysis, nodal analysis, and Thevenin's and Norton's theorems. 5. Impedance and Phasor Diagrams: Understand the concept of impedance and its relationship with resistance,

	capacitance, and inductance. Learn how to represent AC quantities using phasor diagrams and analyze circuit behavior. 6. AC Power Analysis: Study the concepts of active power (real power), reactive power, and apparent power in AC circuits. Learn how to calculate power factor, power factor correction, and perform power calculations. 7. AC Circuit Analysis Techniques: Gain proficiency in solving AC circuit problems involving series and parallel circuits, RC circuits, RL circuits, RLC circuits, resonant circuits, and filters. 8. AC Network Theorems: Understand and apply various network theorems specific to AC circuits, such as maximum power transfer theorem, superposition theorem, and compensation theorem.

9. Teaching and Learning Strategies

Strategy	• Theoretical lectures: to achieve cognitive objectives • Practical laboratory applications: for curriculum components to achieve skills • Dialogues and discussions: during theoretical and practical lectures to achieve • Using general engineering principles: for analyzing and designing engineering problems. • Seminars: Teaching students to give lectures

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	**5T**	1. SINUSOIDAL ac VOLTAGE CHARACTERISTICS AND DEFINITIONS. 2. GENERAL FORMAT FOR THE SINUSOIDAL VOLTAGE OR CURRENT. 3. PHASE RELATIONS.	Sinusoidal Alternating Waveforms	T	Quiz, HW, Exam, Reports

		4. AVERAGE and RMS VALUE.			
	3P	1. To operate and use measuring devices in the Laboratory. 2. Study the characteristics of the sine wave and how to generate it.	AC and sine wave meters	P	
2,3	**10T**	1.RESPONSE OF BASIC R, L, AND C ELEMENTS TO A SINUSOIDAL VOLTAGE OR CURRENT 2. FREQUENCY RESPONSE OF THE BASIC ELEMENTS. 3. AVERAGE POWERAND POWER FACTOR. 4. COMPLEX NUMBERS.	The Basic Elements in the phasor domain	T	Quiz, HW, Exam, Reports
	6P	Understand how a capacitor and inductor react to alternating current and how reactance changes with frequency.	Capacitive reactance and inductive reactance	P	
4,5,6	**15T**	**1.** IMPEDANCE AND THE PHASOR DIAGRAM. 2. SERIES CONFIGURATION. 3. ADMITTANCE AND SUSCEPTANCE. 4. PARALLEL ac NETWORKS. 5. EQUIVALENT CIRCUITS.	Series and Parallel ac Circuits	T	Quiz, HW, Exam, Reports
	9P	1. Calculating the inductive reactance of the coil and the capacitive reactance of the capacitor. 2. Calculating the phase angle between the voltage and current in the circuit.	Series and Parallel ac Circuits	P	
7	**2T**		Mid-EXAM	T	MID-EXAM
	1P		Mid-EXAM	P	

10 ,9 , 8	**15T**	1. SOURCE CONVERSIONS. 2. MESH ANALYSIS. 3. NODAL ANALYSIS. 4. BRIDGE NETWORKS (ac) 5. Conversion Δ-Y, Y- Δ.	Methods of Analysis (ac)	T	Quiz, HW, Exam, Reports
	9P	To study the transient R-C and R-L circuits	Transients in R-C and R-L Series circuits	P	
11, 12,13	**15T**	1.SUPERPOSITION THEOREM. 2. THEVENIN'S THEOREM. 3. NORTON'S THEOREM. 4. MAXIMUM POWER TRANSFER THEOREM.	Network Theorems (ac)	T	Quiz, HW, Exam, Reports
	9P	Applying the theories of analysis in practice and measuring the results practically using measuring devices	Network Theorems (ac)	P	
14, 15	**10T**	1.RESISTIVE CIRCUIT. 2. APPARENT POWER 3. INDUCTIVE CIRCUIT AND REACTIVE POWER 4. CAPACITIVE CIRCUIT 5. THE POWER TRIANGLE 6. POWER-FACTOR CORRECTION	Resonant and power circuits (AC)	T	Quiz, HW, Exam, Reports
	6P	1. WATTMETERS AND POWER-FACTOR METERS. 2. Study of resonance in series RLC circuits.	Resonant and power circuits (AC)	P	

11.Course Evaluation

The grades:
Formative assessment: 40% (10 assignments, 10 Quiz, 10 lab reports, and 10 projects)
Midterm 10%
Final Exam (50%)

12.Learning and Teaching Resources

Required textbooks (curricular books, if any)	Introductory circuit analysis / Robert L. Boylestad.—11th ed.
Main references (sources)	1. Introductory circuit analysis / Robert L. Boylestad.—11th ed. 2. "Engineering Circuit Analysis" by William H. Hayt Jr. and Jack E. Kemmerly. 3. Fundamentals of Electric Circuits" by Charles K. Alexander and Matthew N.O. Sadiku
Recommended books and references (scientific journals, reports...)	Introductory circuit analysis / Robert L. Boylestad.—11th ed
Electronic References, Websites	https://www.coursera.org/browse/physical-science-and-engineering/electrical-engineering.

1. Course Name:	
Physics	
2. Course Code:	
TECK104	
3. Semester / Year:	
Second Semester / First Year	
4. Description Preparation Date:	
01-09-2024	
5. Available Attendance Forms:	
Theoretical	
6. Number of Credit Hours (Total) / Number of Units (Total)	
125/ 3	
7. Course administrator's name (mention all, if more than one name)	
Name: Yahya Ghufran Khidhir Email: yahhya.khidhir24@ntu.edu.iq	
8. Course Objectives	
Course Objectives	• to provide students with basic knowledge and skills in the field of physics, • enabling them to understand natural phenomena • and apply physical principles in the fields of science, engineering and technology
9. Teaching and Learning Strategies	
Strategy	Teaching Methods: • Traditional lectures, report writing, seminar conduct. Assessment Methods: • Daily written and oral tests, applied tests, seminars, semester and final exams, assignments, attendance and commitment, feedback (testing the student on the previous subject), • self-evaluation (questions are set for the student by the teacher and the student) • reports on scientific developments in the field of specialization, and asks analytical and deductive questions.

10. Course Structure					
Week	**Hours**	**Required Learning Outcomes**	**Unit or subject name**	**Learning method**	**Evaluation method**
1	**3T**	**If the student successfully completes this course, he will be able to:** **Knowledge**: Understands fundamental physical quantities, units, and the importance of measurement precision. **Skills:** Converts between unit systems and performs dimensional analysis. **Values:** Develops accuracy, attention to detail, and appreciation for standardized measurement in engineering**.**	Physics and Measurement	T	Tests and Reports
2	**3T**	**Knowledge:** Understands concepts of displacement, velocity, acceleration, and uniformly accelerated motion. **Skills:** Analyzes motion graphs and solves kinematic equations. **Values:** Encourages logical reasoning and clarity in interpreting motion data.	motion in one dimension	T	Tests and Reports
3	**3T**	**Knowledge:** Understands Newton's laws and the relationship between force and motion. **Skills:** Applies Newton’s laws to solve problems	Laws of motion	T	Tests and Reports

		involving forces, friction, and inclined planes. **Values:** Promotes critical thinking and respect for fundamental principles of mechanics.			
4	**3T**	**Knowledge**: Understands kinetic and potential energy, work, power, and conservation of energy. **Skills:** Solves problems using work-energy theorems and identifies energy transformations in systems. **Values:** Encourages appreciation for energy efficiency and sustainability.	Energy and its transfer	T	Tests and Reports
5	**3T**	**Knowledge:** Understands kinetic and potential energy, work, power, and conservation of energy. **Skills:** Solves problems using work-energy theorems and identifies energy transformations in systems. **Values:** Encourages appreciation for energy efficiency and sustainability.	Energy and its transfer	T	Tests and Reports
6	**3T**	**Knowledge:** Understands fluid properties, pressure, buoyancy, and Bernoulli's principle. **Skills:** Analyzes fluid systems using Pascal's and Archimedes' laws and Bernoulli's equation.	Fluid mechanics	T	Tests and Reports

		Values: Develops an awareness of the practical implications of fluid behavior in engineering.			
7	**3T**	**Knowledge:** Reviews and reinforces understanding of motion, forces, energy, and fluid mechanics. **Skills:** Demonstrates the ability to apply concepts in solving integrated physics problems**.** **Values:** Reflects discipline, academic integrity, and preparedness.	Mid-term Exam	T	Tests and Reports
8	**3T**	**Knowledge**: Understands temperature, heat, internal energy, and the First Law of Thermodynamics. **Skills**: Analyzes energy flow in thermodynamic systems and solves problems related to heat transfer. **Values:** Encourages an appreciation of energy conservation in thermal processes**.**	Heat and the First Law of Thermodynamics	T	Tests and Reports
9	**3T**	**Knowledge:** Understands temperature, heat, internal energy, and the First Law of Thermodynamics. **Skills:** Analyzes energy flow in thermodynamic systems and solves problems related to heat transfer**.**	Heat and the First Law of Thermodynamics	T	Tests and Reports

		Values: Encourages an appreciation of energy conservation in thermal processes**.**			
10	**3T**	**Knowledge**: Understands the concept of electric charge, Coulomb's law, and electric field intensity. **Skills:** Calculates electric field strength due to point charges and charge distributions**.** **Values:** Promotes a careful and systematic approach to solving electrostatic problems.	Electric Fields	T	Tests and Reports
11	**3T**	**Knowledge:** Understands the concept of electric charge, Coulomb's law, and electric field intensity. **Skills:** Calculates electric field strength due to point charges and charge distributions. **Values:** Promotes a careful and systematic approach to solving electrostatic problems.	Electric Fields	T	Tests and Reports
12	**3T**	**Knowledge:** Understands the definition of capacitance, energy storage in capacitors, and the effect of dielectrics. **Skills:** Computes equivalent capacitance in circuits and analyzes energy in capacitive systems. **Values:** Encourages responsibility in handling	Capacitance and Dielectrics	T	Tests and Reports

		and applying concepts of electrical energy storage.			
13	**3T**	**Knowledge:** Understands magnetic field concepts, Biot-Savart law, and forces on moving charges. **Skills:** Calculates magnetic forces and field lines for simple current-carrying systems. **Values:** Develops a curiosity-driven mindset for exploring electromagnetism.	Magnetic Fields	T	Tests and Repo
14	**3T**	**Knowledge:** Understands wave-particle duality, reflection, refraction, and lens/mirror laws. **Skills:** Solves problems related to image formation and light behavior in optical systems. **Values:** Fosters appreciation for light's role in modern technology and instrumentation.	The Nature of Light and the Laws of Geometric Optics	T	Tests and Repo
15	**3T**	**Knowledge:** Integrates physics knowledge across mechanics, thermodynamics, and electromagnetism. **Skills:** Develops holistic problem-solving techniques for comprehensive assessment. **Values:** Reinforces perseverance, academic responsibility, and continuous learning.	Preparatory work	T	

11.Course Evaluation	
The grades:	
Quizzes	15
Onsite Assignments	15
Reports	5
Seminars	5
Midterm Exam	10
Final Exam	50
Total	100

12.Learning and Teaching Resources	
Required textbooks (curricular books, if any)	PHYSICS for Scientists and Engineers with Modern Physics', by Raymond A. Serway and John W. Jewett, Jr., Seventh Edition, 2008
Main references (sources)	
Recommended books and references (scientific journals, reports...)	Physics for Scientists and Engineers with Moder Physics, 7th Edition
Electronic References, Websites	Physics for Scientists and Engineers Prof. John C. Armstrong URL: https://www.youtube.com/watch?v=_-xiXY99Rnk&list=PLF7j3NY1Yyp0lIJC3N2IUC jGhcnZuY1

1. Course Name:
Electronics
2. Course Code:
ECE 102
3. Semester / Year:
Second Semester / First Year
4. Description Preparation Date:
1-9- 2024
5. Available Attendance Forms:
Weekly (theoretical and practical lectures) - Mandatory
6. Number of Credit Hours (Total) / Number of Units (Total)
4 Theoretical + 3 Practical (290 hours total) / 8 credit units
7. Course administrator's name (mention all, if more than one name)
Name: Ali Adnan Wahbi Email: ali.adnan@ntu.edu.iq
8. Course Objectives

Course Objectives	• Recognize the electrical properties of semiconductor materials such as silicon and germanium.

	• Identify fundamental electronic components such as the diode and Zener diode. • Explain the operation of bipolar-junction (BJT) as switches and amplifiers. • Acquire analytical skills for electrical and electronic circuit analysis. • Design basic electronic circuits using semiconductor devices. • Employ circuit-simulation software to analyze circuits prior to hardware implementation. • Conduct laboratory experiments that bridge theoretical concepts with practical applications. • Lay the foundation for advanced courses in analogue and digital electronics. • Relate theoretical concepts to real-world applications such as charging circuits and voltage regulators.
9. Teaching and Learning Strategies	
Strategy	• Interactive lectures that simplify complex concepts and employ illustrative graphics to enhance conceptual understanding. • Laboratory correlation: a hands-on experiment follows each theoretical topic, utilizing instruments such as oscilloscopes and power supplies to analyze signals and device characteristics. • Active learning: small-group discussions and problem-solving sessions that foster critical thinking. • Circuit simulation: use of Multisim (or equivalent) to design and simulate circuits, and to compare simulated results with theoretical predictions and laboratory measurements. • Formative quizzes: short assessments that provide continuous feedback on student progress. • Project-based learning: student teams design and realize mini-projects featuring diodes, transistors, or mixed-device circuits.

	• Blended learning: supplemental video lectures and online resources (e.g., MIT Open Courseware) complement classroom delivery. • Use of authentic examples: disassembly and analysis of commercial electronic devices to contextualize course concepts. • Continuous feedback: constructive comments on designs, reports, and laboratory notebooks to guide improvement.

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	**4T**	**If the student successfully completes this course, he will be able to:** **Knowledge:** Distinguish between intrinsic and extrinsic semiconductors and explain the doping process. **Skills:** Interpret variations in electrical properties due to doping. **Values:** Develop scientific rigout, curiosity, and appreciation of theoretical modelling.	Semiconductors and Diode Models (intrinsic vs. extrinsic, doping mechanism)	T	Tests , Assessments Reports
	3P	**Knowledge**: Identify laboratory instruments (ammeter, voltmeter, oscilloscope). **Skills**: Operate instruments safely; obtain accurate measurements. **Values**: Promote safety awareness and precision in experimental work.	Introduction to Diode, introduction to Laboratory instruments	P	
2	**4T**	**Knowledge**: Describe ideal, practical and complete diode models.	Semiconductors and Diode Models (Ideal,	T	Tests , Assessments Reports

		Skills: Select the appropriate model for circuit analysis. **Values**: Foster methodological accuracy in model selection.	Practical, and Complete diode models)		
	3P	**Knowledge**: Observe diode characteristics under forward and reverse bias. **Skills**: Plot experimental curves and analyze data. **Values**: Encourage precision and critical comparison between theory and practice.	Diode characteristics (PN junction)	P	
3	**4T**	**Knowledge**: Explain basic rectifier circuits (half-wave, full-wave center-tap). **Skills**: Differentiate rectifier types and select appropriate configuration. **Values**: Cultivate systematic analysis linking inputs to outputs	Diode Applications (Half-wave rectifier, Full-wave Center-tapped rectifier)	T	Tests , Assessments Reports
	3P	**Knowledge**: Describe hardware implementation of a half-wave rectifier. **Skills**: Assemble circuit and measure rectified output. **Values**: Reinforce safe practice and measurement accuracy.	Half-wave rectifier	P	
4	**4T**	**Knowledge**: Discuss bridge full-wave rectifiers and filter design.	Diode Applications (Half-wave	T	Tests , Assessments Reports

		Skills: Compare rectifier performance with and without filtering. **Values**: Promote responsibility in selecting power-supply solutions.	Bridge rectifier, Rectifiers Filter)		
	3P	**Knowledge**: Show practical operation of bridge rectifier. **Skills**: Build and test bridge rectifier circuit. **Values**: Encourage meticulous lab execution.	Full-wave Bridge rectifier	P	
5	**4T**	**Knowledge**: Understands how the diode is utilized for voltage regulation and signal shaping. **Skills**: Explains practical diode applications for refining and modifying electrical signals. **Values**: Reinforces systematic thinking for circuit analysis and for relating inputs to outputs. Cultivates responsibility in selecting technical solutions that secure power-supply stability. Encourages integration of theory and practice in designing reliable circuits for real-world environments.	Diode Applications (Voltage regulator, Diode Clipper, Clampers)		Tests , Assessments Reports
	3P	**Knowledge**: Recognizes the importance of filters in rectifier circuits. **Skills**: Builds a half-wave and full-wave rectifiers	Full-wave bridge rectifier with filter		

		with a filter and evaluates their efficiency. **Values**: Upholds laboratory safety and vigilance during experimentation. Develops measurement accuracy and troubleshooting skill. Strengthens the link between theoretical understanding and practical application.			
6	**4T**	**Knowledge**: Explains the principles of clamper circuits and voltage multipliers. **Skills**: Identifies practical uses of these circuits across various applications. **Values**: Promotes systematic reasoning in circuit analysis. Encourages responsible choice of technical solutions for stable power delivery. Bridges theoretical concepts with practical circuit design.	Diode Applications (Clampers, Voltage multipliers)	T	Tests , Assessments Reports
	3P	**Knowledge**: Gains hands-on familiarity with clipping circuits. **Skills**: Assembles and tests these circuits and analyses their performance. **Values**: Maintains strict safety and attentiveness in the lab.	Diode Clipper	P	

		Enhances experimental precision and investigative rigout. Integrates theoretical predictions with empirical data.			
7	**4T**	**Knowledge**: Displays comprehensive mastery of all theoretical concepts and functions of electronic components covered in the first half of the course. Shows ability to solve problems and compare different theoretical models. Explains circuit-analysis steps fluently and justifies component or connection choices. **Skills**: Employs technical symbols and terms accurately in written responses. Structures ideas logically and clearly while presenting solutions. Applies electrical-analysis principles with academic rigout. **Values**: Reinforces academic integrity and self-reliance during assessment. Commits to deep conceptual understanding rather than rote memorization. Appreciates proactive revision and personal organization for optimal performance.	Midterm Exam	T	Mid-Term Examination

	3P	**Knowledge**: Gains hands-on familiarity with clamping circuit, and voltage doubler. **Skills**: Assembles and tests these circuits and analyses their performance. **Values**: Promotes adherence to safety procedures and care in the laboratory. Develops practical skill, measurement accuracy, and troubleshooting. Strengthens the integration of theoretical concepts with experimental work.	Diode Clamper and Voltage Doubler	P	
8	**4T**	**Knowledge**: Understands the Zener breakdown mechanism and voltage-regulation characteristics. **Skills**: Analyses the role of the Zener diode in voltage stabilization and related applications. **Values**: Raises awareness of protection and regulation in electronic systems. Encourages precise understanding of circuit behavior under varying voltage and load conditions. Cultivates sound component selection for dependable performance.	Zener Diode (Zener Characteristics, Zener Breakdown, Voltage regulation characteristics)	T	Tests , Assessments Reports
	3P	**Knowledge**: Demonstrates Zener characteristics through	Zener Diode Characteristics	P	

		laboratory experiments. **Skills**: Measures Zener performance and analyses laboratory data. **Values**: Maintains safety and diligence in experimental work. Enhances measurement precision and troubleshooting capability. Links theoretical expectations with practical findings.			
9	**4T**	**Knowledge**: Recognizes how changes in load and input voltage affect a Zener regulator circuit. **Skills**: Selects the appropriate circuit configuration for specific operating conditions. **Values**: Promotes protective-design awareness in electronic systems. Fosters accuracy in understanding circuit performance under variable conditions. Strengthens competence in choosing reliable components.	Zener Diode (Zener regulation with variable input source, regulation with variable load)	T	Tests , Assessments Reports
	3P	**Knowledge**: Understands the practical use of a Zener diode for voltage regulation. **Skills**: Constructs a Zener regulator and evaluates its stability. **Values**: Upholds safety	Zener Voltage regulation	P	

		and attentiveness in the lab. Improves experimental precision and troubleshooting skill. Bridges theoretical analysis with practical measurement.			
10	**4T**	**Knowledge**: Explains how a Zener diode is used in variable-load circuits and for wave shaping. **Skills**: Chooses appropriate circuits for regulation and waveform modification. **Values**: Enhances awareness of protection and regulation in electronic systems. Promotes exact understanding of circuit behavior under changing conditions. Develops sound component selection for reliable design.	Zener Diode (Zener voltage regulation with variable load, Zener limiter)	T	Tests , Assessments Reports
	3P	**Knowledge**: Observes the effect of load variation on a Zener circuit. **Skills**: Performs experiments and analyses circuit behavior under different conditions. **Values**: Maintains strict safety and measurement diligence. Develops troubleshooting skill and empirical analysis.	Zener regulation with variable load	P	

		Confirms theoretical predictions through experimentation.			
11	**4T**	**Knowledge**: Understands transistor structure, classifications, and current-amplification mechanisms. **Skills**: Accurately explains and analyses circuits employing BJTs. **Values**: Encourages critical interpretation of transistor characteristics. Promotes disciplined application of theory in circuit design and analysis. Fosters innovation in using transistors for amplification and control.	Bipolar junction transistor (characteristics, types, current gain calculation)		Tests , Assessments Reports
	3P	**Knowledge**: Identifies transistor characteristics through laboratory measurement. **Skills**: Conducts experiments to measure and analyze transistor performance. **Values**: Enforces laboratory safety and precision. Enhances empirical skills aligned with theory. Strengthens understanding through practical validation.	Transistor characteristics (Determine collector and emitter)		
12-133	**8T**	**Knowledge**: Understands various transistor-biasing techniques and their operational impact.	Bipolar junction transistor (Biasing methods)	T	Tests , Assessments Reports

		Skills: Determines the appropriate biasing method for a given application. **Values**: Develops critical analysis of transistor operation. Reinforces rigorous application of theoretical principles. Encourages creative and effective use of BJTs.			
	6P	**Knowledge**: Demonstrates the effect of biasing methods on transistor performance. **Skills**: Builds bias circuits and measures their behavior. **Values**: Maintains strict safety and accuracy. Enhances troubleshooting competence. Connects theoretical bias concepts with laboratory results.	Different BJT biasing circuits	P	
14	**4T**	**Knowledge**: Learns to plot and analyze transistor characteristic curves and calculate the Q-point. **Skills**: Interprets curves to assess performance and selects the optimal Q-point for efficient operation. **Values**: Strengthens critical evaluation of transistor behavior. Promotes disciplined theoretical application.	Bipolar junction transistor (collector curves, Dc-load line, Q-point)	T	Tests , Assessments Reports

		Encourages innovative circuit optimization.			
	3P	**Knowledge**: Recognizes the transistor working areas, active, cut-off and saturation. **Skills**: ability to use the transistor as a switch in electrical circuits. **Values**: Emphasizes safety and precise measurement. Develops practical understanding of configuration impact. Integrates theory with empirical evaluation.	BJT Transistor as an electrical switch	P	
15	**4T**	**Knowledge**: Recalls key concepts of semiconductors, diode models, rectifiers, Zener diodes, BJTs, and biasing methods. Distinguishes component applications based on functional context. **Skills**: Analyses circuits combining multiple devices. Applies analytical models to interpret circuit responses. **Values**: Enhances self-evaluation and responsibility for final preparation. Encourages integration of concepts for advanced learning.	Preparatory Week (Comprehensive Review)	T	In-class Exercises and Assignments
	3P	**Knowledge**: Integrates theoretical and practical elements for a holistic	Preparatory Week	P	

		understanding of circuit behavior. **Skills**: Revisits earlier experiments, interprets discrepancies between theory and practice. **Values**: Cultivates critical reflection and continuous improvement. Strengthens readiness for higher-level courses.	(Comprehensive Review)		

11.Course Evaluation

The grades:	
Assignments (in-class & take-home)	10
Seminar	5
Quizzes (Testes)	15
Practical (Laboratory Work)	10
Midterm Exam	10
Final Exam	50
Total	100

12.Learning and Teaching Resources

Required textbooks (curricular books, if any)	
Main references (sources)	• Electronic Devices (by: Thomas L. Floyd • Electronic Devices and Circuit Theory (b Robert L. Boylestad, Louis Nashelsky)
Recommended books and references (scientific journals, reports...)	
Electronic References, Websites	MIT OpenCourseWare - Introduction To Electronics, Signals, And Measurement URL: https://ocw.mit.edu/courses/6-071j-introduction-to-electronics-signals-and-measurement-spring-2006/pages/lecture-notes

1. Course Name:	
English Language 2	
2. Course Code:	
NTU200	
3. Semester / Year:	
Second Semester / Second Stage	
4. Description Preparation Date:	
1-9-2024	
5. Available Attendance Forms:	
Weekly (theoretical lectures)	
6. Number of Credit Hours (Total) / Number of Units (Total)	
50 hours total / 2 credit units	
7. Course administrator's name (mention all, if more than one name)	
Name: Email:	
8. Course Objectives	
Course Objectives	● **Introduce students to the concept and function of tenses** in English grammar. ● **Enable accurate use of present tenses** (present simple and present continuous) in various contexts. ● **Develop understanding and use of past tenses** (past simple and past continuous) in narration and description. ● **Teach correct usage of quantity expressions and articles** (a, an, the, some, any, etc.). ● **Familiarize students with common verb patterns**, including gerunds and infinitives. ● **Enable students to express future intentions and plans** using future simple, "going to," and present continuous forms.
9. Teaching and Learning Strategies	
Strategy	Teaching Methods: ● **Interactive grammar presentations** using real-life examples to explain tenses and verb patterns. ● **Context-based exercises** (dialogues, short texts) to practice present, past, and future tenses.

	● **Pair and group activities** for collaborative practice of articles, quantity expressions, and sentence formation. ● **Controlled and free writing tasks** to reinforce grammar usage in context. ● **Role-plays and speaking drills** to apply future intentions and verb patterns in communication. ● **Use of visual aids and timelines** to clarify tense usage and differences. ● **Error correction and peer feedback** to build accuracy and self-awareness in grammar use. Assessment Methods: ● **Quizzes and grammar tests** to evaluate understanding of tenses, articles, and verb patterns. ● **Written assignments and short paragraphs** to assess correct grammar usage in context. ● **Oral presentations or dialogues** to measure spoken accuracy, especially in using tenses and future intentions. ● **In-class activities and group tasks** for formative assessment through participation and collaboration. ● **Error analysis exercises** to assess students' ability to identify and correct grammatical mistakes. ● **Final exam** covering all course topics through a mix of objective and applied questions

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1&2	**2T**	**If the student successfully completes this course, he will be able to:** **Knowledge**: Understand the basic structure and usage of English verb tenses, including the **simple present**, **present continuous**, and an overview of **past** and **future** tenses. **Skills**: Accurately identify and use the correct present tense (simple and	**Introduction to Tenses**	T	Tests and Reports

		continuous) in both **spoken and written English**, and complete practical exercises with increased grammatical accuracy. **Values**: Develop an appreciation for the role of verb tenses in clear communication, and demonstrate **attention to grammatical correctness** in everyday language use.			
3&4	**2T**	**Knowledge**: Explain the differences between the **present simple**, **present continuous**, **present perfect**, and **present perfect continuous** tenses, including their structure and functions. **Skills**: Confidently use all forms of the present tense in **real-life speaking and writing situations**, and distinguish when to use each tense based on context and meaning. **Values**: Show increased **language awareness and responsibility** in selecting appropriate tenses for effective communication in personal, academic, or professional contexts.	Present tenses (present simple and present continuous)	T	Tests and Reports
5&6	**2T**	**Knowledge**: Understand the structure, usage, and key differences between the **past simple** and **past continuous** tenses. **Skills**: Correctly apply both tenses in writing and conversation to describe	Past tenses (past simple , past continuous)	T	Tests and Reports

		past actions, including actions that happened at a specific time and actions in progress in the past. **Values**: Appreciate the importance of **accurate tense usage** to clearly express events and timelines, and develop attention to detail in recounting past experiences.			
7	**2T**	**Knowledge**: Recall and apply key concepts and grammar rules related to **present** and **past tenses**, including correct usage and form of all tenses covered so far. **Skills**: Demonstrate proficiency in selecting and using appropriate verb tenses in **structured exercises**, **gap fills**, and **short writing tasks** that reflect everyday contexts **Values**: Reflect a growing sense of **language responsibility and self-assessment**, recognizing areas of strength and those needing further improvement in grammar and usage.	Mid-term exam	T	Tests and Reports
8&9	**2T**	**Knowledge**: Understand the rules and usage of **quantifiers** (e.g., *some, any, much, many, a few, a little*) and **articles** (*a, an, the*), including their meaning and grammatical functions. **Skills**: Accurately use quantifiers and articles in	**Quantity and Articles** o Quantifiers (some, any, much, many, a few, a little) o Definite and indefinite articles (a, an, the)	T	Tests and Reports

		spoken and written English, especially in describing quantity and specificity in everyday contexts. **Values**: Develop a sense of **clarity and precision** in communication by using appropriate quantity expressions and articles, and show improved attention to grammatical detail.			
10&11	**2T**	**Knowledge**: Understand the rules and usage of **verb patterns** involving **gerunds** and **infinitives**, including common structures like *verb + gerund*, *verb + infinitive*, and *verb + object + gerund/infinitive*. **Skills**: Use appropriate verb patterns in both **written and spoken communication**, and recognize which verbs require specific forms (e.g., *enjoy doing*, *want to do*, *advise someone to do*). **Values**: Show increased grammatical accuracy and **confidence in expressing actions, preferences, and intentions**, while respecting the rules that govern English verb combinations.	Verb Patterns • Gerunds and infinitives • Verb + infinitive, verb + gerund, verb + object + infinitive/gerund	T	Tests and Reports
12&13	**2T**	**Knowledge**: Understand the differences in form and usage between **future simple** (*will*), **"going to"**, and **present continuous** when used for future meanings. **Skills**: Accurately use	**Future Intentions** o Future simple, going to, present continuous for future o Talking about plans, predictions, and intentions	T	Tests and Reports

		various future forms to **talk about plans, predictions, and intentions** in both spoken and written English, applying each form appropriately based on context. **Values**: Develop confidence in **expressing future events and commitments**, and appreciate the role of **tense choice** in communicating clarity and intent in everyday conversation.			
14&15	**2T**	**Knowledge**: Consolidate understanding of all key grammar topics covered in the course, including **tenses, quantifiers, articles, verb patterns**, and **future forms**. **Skills**: Apply grammar rules accurately and fluently through **integrated practice activities**, demonstrating the ability to use correct structures in **real-life communication tasks** (speaking and writing). **Values**: Show **greater language awareness and independence**, recognizing the value of continuous practice and self-correction in developing effective English communication.	**Review and Application** o Comprehensive review of the entire course o Application exercises covering all topics	T	Tests and Reports

11.Course Evaluation

The grades:	
Coursework	40
Midterm Exam	10
Final Exam	50
Total	100

12.Learning and Teaching Resources

Required textbooks (curricular books, if any)	New-Headway 1-2 Authors: Richard Harrison
Main references (sources)	
Recommended books and references (scientific journals, reports...)	
Electronic References, Websites	Online practice portals & YouTube/ Extra grammar, writing, and listening support outside class.

1. Course Name:	
MATH 3	
2. Course Code:	
TECK201	
3. Semester / Year:	
First Semester – Second year	
4. Description Preparation Date:	
1-9- 2024	
5. Available Attendance Forms:	
Weekly (theoretical lectures) - Mandatory	
6. Number of Credit Hours (Total) / Number of Units (Total)	
45 hours total / 3 credit units	
7. Course administrator's name (mention all, if more than one name)	
Name: Maroa Essam Baker Email: Maroa.baker@ntu.edu.iq	
8. Course Objectives	
Course Objectives	This module aims to provide students with a foundational understanding of: 1.Understanding Vectors: The primary goal is to provide students with Understanding the fundamental concepts of vectors 2.Coordinates: The objective of the course is to facilitate students in acquiring a comprehension of the connections and conversions among Cartesian, cylindrical, and spherical coordinates. 3.Partial Differentiation: The aim of this mathematics course is to provide students with a solid understanding of partial differentiation.
9. Teaching and Learning Strategies	
Strategy	**Teaching Methods:** •Theoretical lectures: to achieve cognitive objectives •Dialogues and discussions: during theoretical lectures to achieve

	•Using general engineering principles: for analyzing and designing engineering problems •Application of programming principles and rules: for programmable control systems design. **Assessment Methods:** •Theoretical examinations: periodic and semester exams to verify (A1-A4) •Short tests (Quizzes): continuous assessment •Classroom dialogues and discussions: to verify (A1-A2) •Assignments (Homework's): practical applications •Classroom result presentations: for discussion and student participation

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	**2T**	**If the student successfully completes this course, he will be able to:** **Knowledge:** Introduction to Vectors Components of a vector Unit vectors Vector addition/subtraction **Skills:** Represent vectors in 2D/3D space Calculate magnitude and direction **Values:** Appreciate the role of vectors in physics/engineering		T	Tests and Reports
	2P	**Knowledge**: **Skills**: **Values**:		P	

2	**2T**	**Knowledge**: Vector Algebra Dot product and cross product Scalar and vector projections **Skills:** Solve problems involving work, torque, and angles between vectors **Values:** Recognize real-world applications		T	Tests and Reports
	2P	**Knowledge**: **Skills**: **Values**:		P	
3	**2T**	**Knowledge**: Cartesian Coordinates 2D/3D Cartesian systems Distance and midpoint formulas **Skills:** Plot points and vectors in Cartesian space **Values:** Understand precision in geometric representation		T	Tests and Reports
	2P	**Knowledge**: **Skills**: **Values**:		P	
4	**2T**	**Knowledge**: Cylindrical Coordinates Conversion from Cartesian to cylindrical Applications **Skills:** Transform equations between coordinate systems **Values:** Appreciate efficiency in problem-solving		T	Tests and Reports
	2P	**Knowledge**: **Skills**: **Values**:		P	
5	**2T**	**Knowledge**: Spherical Coordinates Spherical coordinate definitions		T	Tests and Reports

		Conversions (Cartesian ↔ Spherical) **Skills:** Solving problems in astronomy/electrodynamics **Values:** Recognize coordinate systems in nature			
	2P	**Knowledge**: **Skills**: **Values**:		P	
6	**2T**	**Knowledge:** Gradient in Polar Coordinates Gradient operator in cylindrical/spherical systems Directional derivatives **Skills:** Compute gradients for scalar fields **Values:** Link math to physics		T	Tests and Reports
	2P	**Knowledge**: **Skills**: **Values**:		P	
7	**2T**	**Knowledge**: First-Order Partial Derivatives Definition and notation Geometric interpretation **Skills:** Compute partial derivatives of multivariable functions **Values:** Appreciate incremental change analysis		T	Tests and Reports
	2P	**Knowledge**: **Skills**: **Values**:		P	
8	**2T**	**Knowledge**: Higher-Order Derivatives Second-order partial derivatives		T	Tests and Reports

		Clairaut's theorem (symmetry of mixed derivatives) **Skills:** Verify continuity and differentiability **Values:** Precision in mathematical rigor			
	2P	**Knowledge**: **Skills**: **Values**:		P	
9	**2T**	**Knowledge**: Chain Rule Multivariable chain rule Implicit differentiation **Skills:** Apply to related rates problems **Values:** Problem-solving adaptability		T	Tests and Reports
	2P	**Knowledge**: **Skills**: **Values**:		P	
10	**2T**	**Knowledge**: Double Integrals Iterated integrals Fubini's theorem **Skills:** Compute areas/volumes **Values:** Appreciate integration in engineering design		T	Tests and Reports
	2P	**Knowledge**: **Skills**: **Values**:		P	
11	**2T**	**Knowledge**: Changing Order of Integration Limits of integration Simplifying complex regions **Skills:**		T	Tests and Reports

		Switch integration order for efficiency **Values:** Strategic thinking in computation			
	2P	**Knowledge**: **Skills**: **Values**:		P	
12	**2T**	**Knowledge**: Double Integrals in Polar Coordinates Polar area elements Conversions (Cartesian ↔ Polar) **Skills:** Solving problems with circular symmetry **Values:** Recognize symmetry in nature		T	Tests and Reports
	2P	**Knowledge**: **Skills**: **Values**:		P	
13	**2T**	**Knowledge**: Surface Area Parametric surfaces Surface integrals **Skills:** Calculate surface areas **Values:** Link to real-world applications		T	
	2P	**Knowledge**: **Skills**: **Values**:		P	
14	**2T**	**Knowledge**: Review & Applications Recap key concepts **Skills:** Solve integrated problems **Values:** Synthesize interdisciplinary connections		T	

	2P	**Knowledge**: **Skills**: **Values**:		P	
15	**2T**	**Knowledge**: Comprehensive exam **Skills:** Demonstrate mastery of computations **Values:** Reflect on mathematical growth		T	
	2P	**Knowledge**: **Skills**: **Values**:		P	

11.Course Evaluation

The grades:	
Coursework	10
Practical	10
Midterm Exam	30
Final Exam	50
Total	100

12.Learning and Teaching Resources

Required Textbooks (Curricular Books, If Any)	'K.A.Stroud Engineering Mathematics' With Dexter J. Booth, Seventh Edition 2013
Main References (Sources)	
Recommended Books And References (Scientific Journals, Reports...)	
Electronic References, Websites	The Companion Website – Www.Palgrave.Com/Stroud

1. Course Name:	
Operation Amplifier Circuit	
2. Course Code:	
ECE 206	
3. Semester / Year:	
Second Semester / Second Year	
4. Description Preparation Date:	
01-09-2024	
5. Available Attendance Forms:	
Weekly (theoretical and practical lectures) - Mandatory	
6. Number of Credit Hours (Total) / Number of Units (Total)	
250 hours total / 7 credit units	
7. Course administrator's name (mention all, if more than one name)	
Name: Mahmoud Shakir Wahhab Email: mahmoud.eng777@ntu.edu.iq	
8. Course Objectives	
Course Objectives	1- Learn the basic principles of operational amplifiers and their ideal and realistic characteristics. 2- Analyze and design electronic circuits based on operational amplifiers, such as comparators, inverters, non-inverters, integration, and differentiation. 3- Use operational amplifiers in various applications, such as active filters and differential amplifiers. 4- Develop practical skills in simulating, building, and testing operational amplifier circuits using programming tools and laboratories. 5- Enhance the ability to diagnose faults and improve the performance of electronic circuits based on op-amps.
9. Teaching and Learning Strategies	
Strategy	• This course aims to enable students to understand the theoretical foundations and practical applications of operational amplifiers by

	integrating diverse teaching methods that enhance analytical thinking and applied skills. Various teaching strategies are adopted to ensure effective achievement of learning outcomes. • The theoretical content is delivered through interactive lectures that focus on the analytical explanation of basic concepts, such as the characteristics of ideal operational amplifiers, inverting and non-inverting amplifier circuits, and differential amplifier configurations. Student understanding is enhanced through classroom discussions and guided questions that encourage critical thinking and self-exploration. • Laboratory sessions are held to apply theoretical knowledge through the design, simulation, and implementation of practical circuits involving operational amplifiers, such as inverting and non-inverting amplifiers, summer/difference amplifiers, integrators, and differentiators. Specialized simulation software such as Multisim or LTSpice is used alongside a physical breadboard to help students bridge the gap between theoretical understanding and practical application. The course also relies on problem-based learning, where students are required to analyze and design solutions for complex circuits, including multistage amplifiers and active filters such as Butterworth and Chebyshev designs. Mini-projects and practical exercises are integrated

	throughout the semester to encourage engineering problem-solving skills and foster creativity. • Collaborative learning is promoted by assigning students to small groups for design-based projects, including performance analysis and experimental reporting. These activities enhance communication, teamwork, and project management skills. • Multimedia tools, such as educational videos, interactive simulations, and digital learning platforms, are used to visually and dynamically illustrate complex topics. Course materials, lectures, and assignments are shared via an e-learning platform to support ongoing student-teacher interaction. • At the end of the course, students are required to complete a capstone project that involves the design and implementation of an integrated analog system using operational amplifiers, such as an instrumentation amplifier or an active filter. The project culminates in an oral presentation in which students demonstrate their theoretical understanding and practical proficiency.

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	**2T**	**If the student successfully completes this course, he will be able to:** **Knowledge**:	Introduction to Operational Amplifiers:	T	Tests and Reports

		Understanding the characteristics of ideal and real operational amplifiers and their basic applications in electronic systems. **Skills**: Analyzing and designing analog circuits using operational amplifiers, both manually and software-based. **Values**: Commitment to accuracy and responsibility in designing and testing electronic circuits.			
	2P	**Knowledge**: Identify the terminal layout of the 741 operational amplifier and the function of each terminal. **Skills**: Properly connect terminals in practical circuits according to their specific functions. **Values**: Develop technical responsibility in using components according to their specifications to avoid errors or malfunctions.	Identifying the terminals of the 471 operational amplifier	P	
2	**2T**	**Knowledge**: Understanding the ideal characteristics of an operational amplifier, such as high gain, high input impedance, and low output impedance. **Skills**: Analyzing operational amplifier circuits in various voltage and current modes. **Values**: Promoting accuracy and discipline in	Op-Amp basics: ideal characteristics, voltage and current modes, input and output terminals	T	Tests and Reports

		the design and analysis of electronic circuits.			
	2P	**Knowledge**: Distinguish between the characteristics of an ideal operational amplifier (e.g., infinite gain, very high input impedance, zero output impedance) and a realistic one, which includes practical deviations from ideality. **Skills**: Conduct laboratory experiments to measure the actual characteristics of an operational amplifier (e.g., the 741) and compare them to ideal values. **Values**: Develop a sense of rigor and scientific observation in assessing differences between theoretical and applied models.	Measuring the characteristics of ideal and real operational amplifiers	P	
3	**2T**	**Knowledge**: Recognize standard operational amplifier symbols and understand their terminal configuration (positive terminal, negative terminal, output, positive and negative supply). **Skills**: Analyze the performance of operational amplifiers under open-loop conditions and deduce the effects of their characteristics on circuit behavior. **Values**: Develop precision and attention to detail in electronic connections and component selection.	Op-Amp symbols and pin configuration Op-Amp characteristics: open-loop gain, input and output impedance, bandwidth	T	Tests and Reports

	2P	**Knowledge**: Understand the importance of relays in isolating circuits and preventing source loads. **Skills**: Implement a relay circuit using an operational amplifier and measure input and output voltages to verify the gain of a single voltage. **Values**: Develop a practical understanding of the importance of circuit isolation in signaling systems.	Buffer / Voltage Follower Experience	P	
4	**2T**	**Knowledge**: Understanding the mathematical relationship between voltage gain and input and output impedance. **Skills**: Analyzing circuits using basic laws (Ohm's Law, Kirchhoff's Law). **Values**: Improving accuracy in performing mathematical analysis and connecting components.	Inverting amplifier configuration: circuit analysis, gain calculation, input and output impedance	T	Tests and Reports
	2P	**Knowledge**: Understanding the configuration of an inverting-mode operational amplifier and how it inverts and amplifies the input signal. **Skills**: Measuring and analyzing the output signal compared to the input signal to verify the design and performance. **Values**: Enhancing accuracy and attention when implementing and analyzing electronic circuits.	Inverting Amplifier and its Response Analysis	P	

5	**2T**	**Knowledge**: Understanding the configuration of a non-inverting operational amplifier and its connection method, where the signal is fed to the non-inverting (+) terminal. **Skills**: Analyzing the electrical circuit of a non-inverting amplifier and using rules to determine gain. **Values**: Enhancing accuracy and professionalism in circuit design and calibration to achieve the desired gain.	Non-inverting amplifier configuration: circuit analysis, gain calculation, input and output impedance	T	Tests and Reports
	2P	**Knowledge**: Understanding the configuration of an operational amplifier in non-inverting mode and how to amplify an input signal without inverting its phase. **Skills**: Testing and analyzing the output signal against the input signal to verify performance. **Values**: Promoting accuracy and professionalism in the design and implementation of analog circuits.	Non-Inverting Amplifier and Voltage Gain Analysis	P	
6	**2T**	**Knowledge**: Understand the concept of frequency response and its relationship to operational amplifier performance in different frequency ranges. **Skills**: Analyze frequency response curves and	Frequency response and bandwidth considerations	T	Tests and Reports

		determine the practical bandwidth of an amplifier. **Values**: Develop an awareness of the importance of frequencies in the practical design of electronic systems.			
	2P	**Knowledge**: Understand the function of a low-pass filter, which allows low frequencies to pass through and reduces high frequencies above the cutoff frequency. Understand the function of a high-pass filter, which allows high frequencies to pass through and reduces low frequencies below the cutoff frequency. **Skills**: Analyze and design filter circuits using resistors and capacitors to determine the appropriate cutoff frequency. **Values**: Develop precision in selecting appropriate component values to achieve the desired performance.	Low Pass Filter and High Pass Filter	P	
7	**2T**	**Knowledge**: Understand the construction of a differential amplifier, which amplifies the difference between two input signals and reduces the influence of the common signals. **Skills**: Analyze a differential circuit using electrical laws and determine the required gains. **Values**: Develop engineering sense in designing circuits capable	Differential amplifier configuration: circuit analysis, common-mode and differential-mode gains, CMRR	T	Tests and Reports

		of isolating useful signals from noise.			
	2P	**Knowledge**: Understand the importance of common-mode rejection ratio (CMRR) in improving amplifier performance. **Skills**: Design circuits to achieve high differential gain and good CMRR. **Values**: Value precision and discipline in designing and implementing noise-sensitive circuits.	Differential Amplifier	P	
8	**2T**	**Knowledge**: Recognize the advantages of instrumentation amplifiers, such as high gain, high input impedance, and high CMRR. **Skills**: Apply instrumentation amplifiers in the design of precision measurement circuits that require a clean and stable output signal. **Values**: Promote accuracy and discipline in the implementation and design of measurement circuits.	Instrumentation amplifier: advantages, circuit analysis, gain calculation, applications in precision measurements	T	Tests and Reports
	2P	**Knowledge**: Understand the function of a voltage comparator, which compares two input signals and produces a high or low digital output depending on the comparator signal. **Skills**: Design and analyze comparator and zero detector circuits using an operational amplifier. **Values**: Develop precision	Voltage comparator and zero detector for sensing AC signals	P	

		in connection and measurement to ensure accurate and precise response.			
9	**2T**	**Knowledge**: Understand the construction of a summing amplifier and how to connect multiple input signals together at the input of an operational amplifier. **Skills**: Apply the concept of virtual ground to simplify circuit analysis and ensure its stability. **Values**: Enhance the ability to connect theoretical concepts with practical applications in circuit design.	Summing amplifier configuration: circuit analysis, weighted summing, virtual ground concept	T	Tests and Reports
	2P	**Knowledge**: Understand the working principle of a summing amplifier, which combines multiple electrical input signals and produces an output signal representing their weighted sum. **Skills**: Calculate output signals resulting from a range of different input voltages. **Values**: Enhance accuracy in selecting resistor values to achieve the desired summation ratios.	voltage summing amplifier	P	
10	**2T**	**Knowledge**: Understand the configuration of a differential amplifier used to subtract two input signals (differential-difference operation). **Skills**: Evaluate the efficiency of a circuit in reducing noise and unwanted signals using	Difference amplifier configuration: circuit analysis, subtraction operation, common-mode rejection	T	Tests and Reports

		the CMRR concept. **Values**: Promote analytical thinking in microcircuit design to separate useful signals from noise.			
	2P	**Knowledge**: Understand the working principle of a subtractive amplifier, which produces an output signal representing the difference between two input signals. **Skills**: Analyze and design subtractive amplifier circuits using operational amplifiers and resistors. **Values**: Develop an awareness of the importance of accurate signal processing in engineering applications.	Subtractor Amplifier	P	
11	**2T**	**Knowledge**: Understand the construction of integrator and differentiator circuits using operational amplifiers. **Skills**: Analyze integrator and differentiator circuits mathematically in terms of input and output voltages. **Values**: Enhance theoretical understanding for application in designing efficient analog signal processing circuits.	Integrators and Differentiators: Op-Amp integrator and differentiator circuits: circuit analysis, frequency response, application in analog signal processing, application in waveform shaping.	T	Tests and Reports
	2P	**Knowledge**: Understanding the working principle of an integrator/differential circuit that calculates the time integral and differentiation of an input signal. **Skills**: Analyzing and	Integrator Circuit and Differentiator Circuit	P	

		designing integrator/differential circuits using operational amplifiers and passive components (resistors and capacitors). **Values**: Developing analytical thinking and linking theory to practical application in the field of signal processing.			
12	**2T**	**Knowledge**: Identify first- and second-order active filter types (low-pass, high-pass, band-pass, and band-stop). **Skills**: Analyze and design active filter circuits according to frequency requirements. **Values**: Develop engineering sense for designing microelectronic systems based on frequency processing.	Active Filters:First-order and second-order active filters: low-pass, high-pass, band-pass, and band-stop configurations	T	Tests and Reports
	2P	**Knowledge**: Understand the working principle of a first-order active low-cut filter, which uses an operational amplifier with resistors and capacitors to determine the cutoff frequency. **Skills**: Measure the filter's frequency response and determine the actual cutoff frequency. **Values**: Enhance precision in selecting component values to achieve the desired performance.	(Active Low-Pass Filter - First Order)	P	
13	**2T**	**Knowledge**: Understand the basic concepts of filter and amplifier design. **Skills**: Identify the relationship between the	Design considerations: cutoff frequency, quality factor,	T	

		quality factor and system selectivity, especially for second-order filters. **Values**: Enhance accuracy and professionalism in selecting component values to achieve optimal performance.	selectivity, gain requirements		
	2P	**Knowledge**: Understand the concept of cutoff frequency, which is the frequency at which the filter response drops to 70.7% of its maximum value (−3 dB). **Skills**: Accurately calculate the cutoff frequency using the resistor and capacitor values in the circuit. **Values**: Develop precision and care in selecting appropriate components to achieve stable filter performance.	Cut-off Frequency Analysis of a First Order Filter	P	
14	**2T**	**Knowledge**: Distinguish between the characteristics of each filter in terms of shape, frequency response, and effectiveness in various applications. **Skills**: Select the appropriate filter type based on application requirements, such as resolution, transition sharpness, or ripple tolerance. **Values**: Enhance analytical thinking to select the most appropriate design in terms of performance and efficiency.	Butterworth and Chebyshev filter responses	T	

	2P	**Knowledge**: Understand the characteristics of a second-order Butterworth low-pass filter, which has a flat frequency response within the passband without ripples. **Skills**: Design and analyze a second-order Butterworth low-pass filter circuit using an operational amplifier, resistors, and capacitors. **Values**: Enhance precision in component selection to achieve the desired signal processing performance.	Second-order Butterworth low-pass filter	P	
15	**2T**	**Knowledge**: Identify active filters that use operational amplifiers in combination with resistors and capacitors to determine the frequency response. **Skills**: Design and analyze first- and second-order active filter circuits using appropriate laws and equations. **Values**: Develop a deep understanding of the importance of frequency control in signal processing systems.	Active Filter Review: First and Second Class Active Filters	T	
	2P	**Knowledge**: Understand the characteristics of a second-order Butterworth high-pass filter, which allows high frequencies to pass through with a flat response within the passband. **Skills**: Calculate the cutoff frequency and quality factor, and adjust component values to	Second-order Butterworth high-pass filter	P	

		achieve the desired response. **Values**: Develop design sense and adherence to engineering standards in circuit implementation.			

11.Course Evaluation

The grades:	
Coursework	10
Practical	10
Midterm Exam	30
Final Exam	50
Total	100

12.Learning and Teaching Resources

Required textbooks (curricular books, if any)	Operational Amplifiers and Linear Integra Circuits Electronic Devices and Circuit Theory" by Robe L. Boylestad & Louis Nashelsky
Main references (sources)	Design with Operational Amplifiers and Ana Integrated Circuits Operational Amplifiers and Linear Integra Circuits
Recommended books and references (scientific journals, reports...)	
Electronic References, Websites	**https://www.ti.com/amplifier-circuit/op-amps/overview.html** **https://www.analog.com/en/products/amplifiers/op-amps.html** **https://www.electronics-tutorials.ws/opamp/opamp_1.html**

1. Course Name:
MATH 4
2. Course Code:
TECK202
3. Semester / Year:
Second Semester – Second year
4. Description Preparation Date:
1-9-2024
5. Available Attendance Forms:
Weekly (theoretical lectures) - Mandatory
6. Number of Credit Hours (Total) / Number of Units (Total)
45 hours total / 3 credit units
7. Course administrator's name (mention all, if more than one name)
Name: Maroa Essam Baker Email: Maroa.baker@ntu.edu.iq
8. Course Objectives

Course Objectives	This module aims to provide students with a foundational understanding of: 1. Partial Differentiation: The aim of this mathematics course is to provide students with a solid understanding of partial differentiation, enabling them to apply this powerful tool in solving problems involving functions of multiple variables, optimization, and real-world applications in various disciplines. 2. Multiple Integrals: The aim of a mathematics course focusing on Multiple Integrals, including Double Integrals, Changing the Order of Integration, Double Integrals in Polar Coordinates, and Surface Area. 3. Understanding Complex Numbers: The objective of this math course is to equip students with a comprehensive understanding of complex numbers and their properties. Through mastery of complex numbers, students will develop the ability to perform operations, solve equations, and apply complex numbers effectively in diverse mathematical and scientific scenarios 4. Understanding ODEs: The aims of a math course focused on Ordinary Differential Equations (ODEs) of first and second order. Through this course,

	students will develop a solid understanding of ODEs, acquire problem-solving skills, and apply these mathematical tools in various scientific and engineering contexts.

9. Teaching and Learning Strategies

Strategy	**Teaching Methods:** •Theoretical lectures: to achieve cognitive objectives •Dialogues and discussions: during theoretical lectures to achieve •Using general engineering principles: for analyzing and designing engineering problems •Application of programming principles and rules: for programmable control systems design. **Assessment Methods:** •Theoretical examinations: periodic and semester exams to verify (A1-A4) •Short tests (Quizzes): continuous assessment •Classroom dialogues and discussions: to verify (A1-A2) •Assignments (Homework's): practical applications •Classroom result presentations: for discussion and student participation

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	**2T**	**If the student successfully completes this course, he will be able to:** **Knowledge**: **Complex Numbers & Polar Form** Definition of complex numbers Polar) and Euler's formula **Skills:**		T	Tests and Reports

		Convert between rectangular and polar forms Perform arithmetic operations (addition, multiplication) **Values:** Appreciate the elegance of complex numbers in unifying algebra and geometry			
	2P	**Knowledge**: **Skills**: **Values**:		P	
2	**2T**	**Knowledge**: Infinite Series & Power Series Definition of infinite series and partial sums Power series expansions **Skills:** Compute sums of simple series (geometric, telescoping) **Values:** Recognize series as foundations for approximations in engineering		T	Tests and Reports
	2P	**Knowledge**: **Skills**: **Values**:		P	
3	**2T**	**Knowledge**: Convergence & Divergence of Series Tests for convergence (ratio, root, comparison) Absolute vs. conditional convergence **Skills:** Apply convergence tests to determine series behavior **Values:** Develop logical reasoning in mathematical analysis		T	Tests and Reports

	2P	**Knowledge**: **Skills**: **Values**:		P	
4	**2T**	**Knowledge**: Complex Functions **Skills:** Visualize complex mappings **Values:** Connect complex analysis to fluid dynamics/electromagnetics		T	Tests and Reports
	2P	**Knowledge**: **Skills**: **Values**:		P	
5	**2T**	**Knowledge**: Cauchy-Riemann Equations Necessary/sufficient conditions for differentiability Harmonic functions and conjugates **Skills:** Verify analyticity using Cauchy-Riemann equations **Values:** Appreciate mathematical rigor in defining "smooth" functions		T	Tests and Reports
	2P	**Knowledge**: **Skills**: **Values**:		P	
6	**2T**	**Knowledge**: Taylor Series (Complex) Taylor expansions for analytic functions Radius of convergence **Skills:** Derive Taylor series **Values:** Understand how series enable solving ODEs		T	Tests and Reports

	2P	**Knowledge**: **Skills**: **Values**:		P	
7	**2T**	**Knowledge**: First-Order ODEs – Separation of Variables Separable ODEs Initial value problems **Skills:** Solve population growth/decay problems **Values:** Model real-world phenomena		T	Tests and Reports
	2P	**Knowledge**: **Skills**: **Values**:		P	
8	**2T**	**Knowledge**: Homogeneous Differential Equations Homogeneous ODEs Substitution methods **Skills:** Transform and solve homogeneous ODEs **Values:** Recognize scaling symmetries in physics/biology		T	Tests and Reports
	2P	**Knowledge**: **Skills**: **Values**:		P	
9	**2T**	**Knowledge**: Linear & Bernoulli ODEs Linear first-order ODEs Bernoulli equations **Skills:** Integrate using integrating factors **Values:** Appreciate historical context		T	Tests and Reports
	2P	**Knowledge**: **Skills**: **Values**:		P	

10	**2T**	**Knowledge**: Exact & Non-Exact ODEs Exact condition Integrating factors for non-exact ODEs **Skills:** Test for exactness and solve **Values:**Link to thermodynamics (differential forms)		T	Tests and Reports
	2P	**Knowledge**: **Skills**: **Values**:		P	
11	**2T**	**Knowledge**: Applications of First-Order ODEs Newton's cooling law, RC circuits, mixing problems **Skills:** Model and solve application-driven ODEs **Values:** Ethical considerations in modeling		T	Tests and Reports
	2P	**Knowledge**: **Skills**: **Values**:		P	
12	**2T**	**Knowledge**: Second-Order Linear ODEs – Homogeneous Solutions Characteristic equation (constant coefficients) **Skills:** Solve spring-mass systems (damped/unforced) **Values:** Connect to harmonic motion in engineering		T	Tests and Reports
	2P	**Knowledge**: **Skills**: **Values**:		P	
13	**2T**	**Knowledge**: Non-Homogeneous Linear ODEs		T	

		Method of undetermined coefficients Superposition principle **Skills:** Solved oscillators **Values:** Understand resonance in bridges/machines			
	2P	**Knowledge**: **Skills**: **Values**:		P	
14	**2T**	**Knowledge**: Variation of Parameters Wronskian and fundamental sets **Skills:** Apply to ODEs with non-constant coefficients **Values:** Appreciate generalization in mathematical methods.		T	
	2P	**Knowledge**: **Skills**: **Values**:		P	
15	**2T**	**Knowledge**: Applications of Second-Order ODEs Electrical circuits (RLC), forced vibrations **Skills:** Model and interpreting solutions physically **Values:** Ethical design in engineering.		T	
	2P	**Knowledge**: **Skills**: **Values**:		P	

11.Course Evaluation

The grades:	
Coursework	10
Practical	10
Midterm Exam	30
Final Exam	50

Total	100

12.Learning and Teaching Resources

Required textbooks (curricular books, if any)	'K.A.STROUD Engineering Mathematics' with DEXTER J. BOOTH, seventh edition 2013
Main references (sources)	
Recommended books and references (scientific journals, reports...)	
Electronic References, Websites	The companion website – www.palgrave.com/stroud

1. Course Name:
Electromagnetic Fields (1)
2. Course Code:
ECE204
3. Semester / Year:
First Semester / Second Year
4. Description Preparation Date:
01-09-2024
5. Available Attendance Forms:
Weekly (Theoretical Lectures)
6. Number of Credit Hours (Total) / Number of Units (Total)
45/3
7. Course administrator's name (mention all, if more than one name)
Name: Mayada Jasim Hamwdi Email: mayadajas@ntu.edu.iq

8. Course Objectives	
Course Objectives	• Study the basic principles of electromagnetic fields. • Provide students with fundamental knowledge in electromagnetic fields required for several advanced courses in later years.

9. Teaching and Learning Strategies	
Strategy	Lectures, presentations, and documentation. ● Inquiry-based learning: Encouraging students to ask questions and explore physical relationships through experiments or simulations. ● Practical applications: Illustrating how concepts are used in designing capacitors, generators, or power transmission lines.

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method

1	3 hr.	**If the student successfully completes this course, he will be able to:** **Knowledge**: Understanding basic concepts: Distinguishing between scalar quantities and vector quantities, and identifying the characteristics of each. **Skills:** Logical analysis: the ability to break down a problem and understand the relationships between different quantities. Problem-solving: applying concepts to solve complex real-life or scientific problems. Values: **Values:** evaluating matters based on data and facts. Diligence and perseverance: especially when facing complex problems that require time.	Scalars and Vectors, Vector Analysis, Cartesian Coordinate System	Theoretica	Exams and Oral Questions
2	3 hr.	**Knowledge:** Understanding the concept of a unit vector and how to use it to determine direction, distinguishing between dot product and vector product in terms of definition, use, properties, and analyzing the vector into its components in the coordinate plane or three-dimensional space. **Skills:** Calculating vector components using angles and coordinates, applying the dot product to determine the angle or	Vector Components and Unit Vector, Dot Product and Cross Product.	Theoretica	Exams and Oral Questions

		measure the work done in physics. Using the vector product to find a vector perpendicular to two planes or certain vectors. Representing vector operations graphically and analytically using geometric tools or computer programs. **Values:** Enhancing accuracy and mental discipline in processing complex problems. Instilling a spirit of cooperation when solving group exercises that depend on the integration of solutions and fostering mathematical and geometric creativity in dealing with dimensions and directions.			
3	3 hr.	**Knowledge:** Understanding the characteristics of cylindrical and spherical coordinate systems and comparing them to the Cartesian system. Grasping how to convert coordinates from one system to another using appropriate mathematical relationships. Recognizing the advantages of using each coordinate system in different physical or engineering contexts and interpreting the mathematical representation of objects or points within the three systems. **Skills:**	Co – ordinate System: Cylindrical and Spherical. Relation between Different Coordinate System.	Theoretica	Exams and Oral Questions

		Accurately converting points and vectors between Cartesian, cylindrical, and spherical coordinate systems. Analyzing mathematical or physical problems and selecting the most suitable coordinate system for the solution. Representing data and fields using three-dimensional graphing tools. **Values:** Promoting mathematical accuracy and intellectual discipline when dealing with transformations of complex systems. Developing mental flexibility in switching perspectives or methods of analysis as needed. Elevating the practical application of mathematics in science and engineering. Encouraging a spirit of discovery and experimentation in dealing with various dimensions and geometric shapes.			
4	3hr.	**Knowledge:** Understanding Coulomb's law in terms of the mathematical formula and the physical meaning. Recognizing the factors affecting the electric force between two-point charges (distance, magnitude of charge, type of charge). **Skills:** Calculating the electric force between two-point charges using Coulomb's	Coulomb’s Law, Electric Field I3ntensity and its evaluation for Point Charge and Line charge	Theoretica	Exams and Oral Questions

		law. Determining the electric field strength produced by a point charge at a specific point. **Values:** Developing accuracy and attention to detail in handling sensitive mathematical relationships. Promoting a scientific and logical approach to interpreting electrical phenomena.			
5	3 hr.	**Knowledge:** Differentiating between the test charge and the source charge in electric field analysis. Understanding that the electric field is a vector quantity with both magnitude and direction. **Skills:** Analyzing and interpreting the results of numerical problems related to the electric field and charges. **Values:** Encouraging collaboration in solving physical problems by exchanging ideas with others. Fostering an appreciation for scientific applications that rely on the fundamental concepts of electricity (such as electronics and smart devices).	Coulomb's Law, Electric Field Intensity and its evaluation for • Surface Charge • Volume Charge Distribution	Theoretica	Exams and Oral Questions
6	3 hr.	**Knowledge:** Understanding Coulomb's law to determine the electric force between two-point charges. Analyzing the electric field produced	Field of N Point Charge	Theoretica	Exams and Oral Questions

		by a single charge and a group of charges, and recognizing the effect of distance, direction, and charge on the electric field. **Skills:** The ability to calculate the electric field intensity at a certain point resulting from N charges. Analyzing the directions and vectors associated with the field. Applying drawing and graphical representation skills for field lines. **Values:** Promoting accuracy and discipline in physical calculations. Fostering a spirit of scientific curiosity to understand electromagnetic phenomena. Developing teamwork through discussing and analyzing problems with others.			
7	3 hr.	**Knowledge:** Understanding the fundamental principles of electricity and magnetism, such as Coulomb's law, electric field, and magnetic field. Recognizing how charges and electric currents interact with their surrounding fields. **Skills:** Analyzing electromagnetic problems and selecting appropriate laws for solutions. Graphically and quantitatively drawing and interpreting electric or magnetic field lines. **Values:**	Midterm exam	Theoretica	Semester exam

		Promoting accuracy and attention to detail in analyzing equations and physical models. Fostering scientific curiosity to understand the electrical and magnetic phenomena around us.			
8	3 hr.	**Knowledge:** Understand the concept of electric flux through a closed surface. Recognize Gauss's law and its mathematical formulation, and connect it with Coulomb's law in suitable cases. Understand applications of Gauss's law in the distribution of symmetrical charges (spherical, cylindrical, planar). **Skills:** Ability to determine when and how Gauss's law can be effectively used to solve problems. Use geometric symmetry to simplify calculations related to electric fields. Solve problems involving the calculation of electric field or flux in various systems. **Values:** Promote discipline and accuracy in working with physical laws. Foster a scientific spirit and inquiry to understand theoretical models and their practical applications. Establish values of scientific integrity and objectivity in presenting solutions and results.	Gauss Law	Theoretica	Exams and Oral Questions

9	3 hr.	**Knowledge:** A fundamental understanding of Gauss's Law in terms of the integral form and its relation to the concept of electric flux. Distinguishing the relationship between Gauss's Law and Coulomb's Law and their applications under different conditions. Recognizing the conditions for effectively using Gauss's Law (the presence of spherical, cylindrical, or planar symmetry). **Skills:** Identifying optimal Gaussian surfaces to simplify physical problems. The ability to analyze symmetrical charge distributions and accurately calculate the resulting fields. Using mathematical reasoning to simplify formulas and derive results in innovative ways, translating physical scenarios into clear and computable mathematical models. **Values:** Developing a love for simplification and symmetry as a powerful intellectual tool in the sciences. Respecting accuracy and discipline in the use of physical laws and applying them in appropriate contexts.	Gauss Law and its Applications	Theoretical	Exams and Oral Questions

10	3 hr.	**Knowledge:** Understanding the physical significance of the equation and linking it to the concept of the electric field generated by the distribution of electric charges. Recognizing the mathematical connection between Gauss's Law and Maxwell's equations. Comprehending the concept of charge volume density (ρ) and its effect on the behavior of the electric field, as well as understanding the role of the permittivity of free space (ε_0) in determining the intensity of the field. **Skills:** The ability to analyze physical systems containing different charge distributions and to interpret the properties of the resulting electric field. Using the differential formula of Gauss's Law to calculate local values of the electric field and constructing mathematical models for electrostatic situations using Maxwell's first equation. **Values:** Promoting scientific curiosity to discover how major laws in physics are built from simple concepts. Developing an awareness of precision and methodological rigor in constructing mathematical models. Instilling values of	Maxwell's First Equations (Electrostatics)	Theoretical	Exams and Oral Questions

		interconnectedness between mathematics and physics as a key to understanding nature and respecting the scientific and logical approach to interpreting phenomena and analyzing problems.			
11	3 hr.	**Knowledge:** Understanding the concept of divergence as the net flow rate from a point in space. Connecting vector fields with volumetric and surface integrals. Knowing the conditions for applying the theorem. **Skills:** Solving mathematical problems that require applying the divergence theorem to calculate surface flow. The ability to select the appropriate coordinate system (spherical, cylindrical, Cartesian) to simplify integrals. **Values**: Promoting a spirit of precision and order in addressing complex problems and using mathematical laws.	Divergence Theorem	Theoretica	Exams and Oral Questions
12-13	3 hr.	**Knowledge:** Understanding the concept of electric potential as a result of a point charge and its effect on other charges. Recognizing that the electric field is a conservative field, thus work depends only on the initial and final positions. **Skills:**	Energy and Potential and Energy expended in moving a point charge in an electric field.	Theoretica	Exams and Oral Questions

		Calculating the work done in moving a charge from one point to another within an electric field. Representing the relationships between voltage, energy, and field using graphs and equations. **Values:** Reinforcing understanding of causal and functional relationships between physical concepts. Enhancing accuracy and logical consistency in constructing and interpreting computational models.			
14	3 hr.	**Knowledge:** Understanding that the electric field is a conservative field, and the work done depends only on the starting and ending points. Distinguishing between electric **Skills:** The ability to calculate the work done through line integration using field data or from its equations. Analyzing the relationship between field, potential, and energy in real or hypothetical scenarios. Using graphical representation and trend analysis to determine the direction of forces and the amount of work. **Values:** Enhancing accuracy and methodic Alness in	Energy and Potential: Energy expended in moving a point charge in an electric field and the line integral	Theoretica	Exams and Oral Questions

		mathematical analysis and physical application.			
15	3 hr.	**Knowledge:** Understanding the fundamental principles of electricity and magnetism, such as Coulomb's law, electric field, and magnetic field. Recognizing how charges and electric currents interact with their surrounding fields. **Skills:** Analyzing electromagnetic problems and selecting appropriate laws for solutions. Graphically and quantitatively drawing and interpreting electric or magnetic field lines. **Values:** Promoting accuracy and attention to detail in analyzing equations and physical models. Fostering scientific curiosity to understand the electrical and magnetic phenomena around us.	Preparatory Week	Theoretica	Comprehensive review

11.Course Evaluation

The grades:

Coursework	10
Midterm Exam	30
Final Exam	60
Total	100

12.Learning and Teaching Resources

Required textbooks (curricular books, if any)	• Engineering Electromagnetics, William H. Hayt, Published by Mcgraw- Hill • Elements of Electromagnetics, Matthew N.O. Sadiku
Main references (sources)	

Recommended books and references (scientific journals, reports...)	Electromagnetic Field Theory By Uday A. Bakshi, Late Ajay V. Bakshi · 2020
Electronic References, Websites	

1. Course Name:
Electronic Circuits
2. Course Code:
ECE 201
3. Semester / Year:
First Semester / Second Year
4. Description Preparation Date:
01-09-2024
5. Available Attendance Forms:
Weekly (theoretical and practical lectures) - Mandatory
6. Number of Credit Hours (Total) / Number of Units (Total)
250 hours total / 10 credit units
7. Course administrator's name (mention all, if more than one name)
Name: Mahmoud Shakir Wahhab Email: mahmoud.eng777@ntu.edu.iq

8. Course Objectives	
Course Objectives	• Understanding fundamental concepts. • Developing electronic circuit analysis skills. • Familiarity with electronic components. • Developing amplifier design skills. • Practical circuit design and analysis.

9. Teaching and Learning Strategies	
Strategy	Teaching Methods: • Theoretical lectures: To achieve cognitive objectives • Practical laboratory application: To cover curriculum content and acquire skills • Dialogues and discussions: During theoretical and practical lectures • Use of general engineering principles: To analyze and design engineering problems.

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	**4T**	**If the student successfully completes**	Review of basic concepts: Diode	T	

		this course, he will be able to: **Knowledge**: Distinguish between different types of diodes and their uses in electronic circuits. **Skills**: Design rectifier and voltage regulator circuits and protection applications using appropriate diodes. **Values**: Appreciate the importance of selecting appropriate electronic components to achieve efficiency and reliability.	structure, operation, types and applications		Tests and Reports
	3P	**Knowledge**: Understanding the structure of a diode and its operation under different bias conditions. **Skills**: Analyzing and operating circuits containing diodes using measurement and simulation tools. **Values**: Commitment to accuracy and professionalism in conducting experiments and analyzing electronic results.	Characteristics of diode (forward and reverse bias), half-wave rectifier and wave rectifier	P	
2	**4T**	**Knowledge**: Understanding the operating principle in cutoff, saturation, and active region modes. **Skills**: Applying appropriate biasing techniques to ensure stability and good performance. **Values**: Developing	Bipolar Junction Transistors (BJTs): BJT structure, operation, characteristics and biasing techniques.	T	Tests and Reports

		analytical thinking to select the most appropriate electronic solutions.			
	3P	**Knowledge**: Explain the structure of a BJT and the function of each terminal. **Skills**: Analyze circuits containing BJT transistors, both practically and theoretically. **Values**: Commitment to precision when designing and operating amplification or switching circuits.	Characteristics of NPN transistor	P	
3	**4T**	**Knowledge**: Understanding the physical properties and biasing techniques appropriate for each type. **Skills**: Analyzing FET circuits theoretically and practically using schematics and curves. **Values**: Promoting precision and discipline in the construction and operation of electronic circuits.	Field-Effect Transistors (FETs): (JFET and MOSFET) structure, operation, characteristics and biasing techniques.	T	Tests and Reports
	3P	**Knowledge**: Understanding the operating mechanism and operating zones (cutoff, ohmic, saturation). **Skills**: Designing circuits containing FETs and selecting the appropriate biasing technique. **Values**: Developing a spirit of innovation in selecting the most appropriate transistor for the application (amplification, control, efficiency).	Characteristics of JFET transistor	P	

4	**4T**	**Knowledge**: Identify the voltage, current, and gain characteristics of this configuration. **Skills**: Analyze the performance of a common-emitter amplifier in terms of gain and impedance. **Values**: Develop a practical understanding of the importance of amplifiers in electronic systems.	Amplifier configurations: BJT amplifiers: common emitter configuration.	T	Tests and Reports
	3P	**Knowledge**: Understand the working principle of the common emitter configuration and its role in signal amplification. **Skills**: Design and operate a BJT amplifier circuit. **Values**: Commitment to precision in component selection and analysis of results.	common emitter amplifier	P	
5	**4T**	**Knowledge**: Distinguish between the characteristics of common-base and common-collector configurations. **Skills**: Analyze and operate amplifier circuits in both common-base and common-collector configurations. **Values**: Commitment to precision in measurement and analysis to evaluate amplifier performance.	Amplifier configurations: BJT amplifiers: common base, and common collector configurations.	T	Tests and Reports
	3P	**Knowledge**: Understand the effect of each configuration on gain, impedance, and signal response. **Skills**: Select the appropriate configuration	Common collector and base amplifier	P	

		based on gain or impedance requirements. **Values**: Promote engineering thinking in selecting the best configurations for a given application.			
6	**4T**	**Knowledge**: Distinguish between BJT amplifier configurations in terms of construction and performance. **Skills**: Analyze and design amplifier circuits using the appropriate configuration. **Values**: Develop critical thinking in selecting the optimal configuration for the desired application.	Review of BJT amplifier configurations.	T	Tests and Reports
	3P	**Knowledge**: Understand the effect of each configuration on voltage, current, and impedance. **Skills**: Measure and interpret the gain and response characteristics of each configuration. **Values**: Commitment to accuracy and professionalism in performing and analyzing experiments.	Review of all types of amplifiers (common emitter, collector, and base)	P	
7	**4T**	**Knowledge**: Identify the characteristics of common-source, common-gate, and common-drain configurations. **Skills**: Analyze and design amplifier circuits using FETs according to the appropriate configuration. **Values**: Promote logical thinking in selecting the optimal configuration for an electronic application.	FET amplifiers: common source, common gate, and common drain configurations.	T	Tests and Reports

	3P	**Knowledge**: Understanding the effect of each configuration on gain, impedance, and signal response. **Skills**: Using measuring tools to evaluate amplifier performance in practice. **Values**: Commitment to accuracy and documentation in conducting and analyzing experiments.	common source amplifier	P	
8	**4T**	**Knowledge**: Learn how to represent and analyze small-signal circuits theoretically. **Skills**: Calculate various types of gain values using small transistor models. **Values**: Develop precision in implementing and analyzing electronic circuits.	Amplifier circuits: BJT small-signal amplifiers: voltage gain, current gain, and power gain.	T	Tests and Reports
	3P	**Knowledge**: Understand the concepts of voltage gain, current gain, and power gain in small-signal amplifiers. **Skills**: Analyze circuit performance practically using measurement and simulation tools. **Values**: Promote a deep understanding of the importance of signal gain in various amplification applications.	Calculating the voltage gain of a common emitter circuit	P	
9	**4T**	**Knowledge**: Understand the concepts of voltage, current, and power gain in small-signal amplifiers using FETs. **Skills**: Calculate and analyze various types of gain using small-signal	Amplifier circuits: FET small-signal amplifiers: voltage gain, current gain, and power gain.	T	Tests and Reports

		FET modeling. **Values**: Develop an applied understanding of the importance of gain in various electronic circuits.			
	3P	**Knowledge**: Identify the characteristics of small-signal circuits and interpret their behavior. **Skills**: Implement amplifier circuits practically and evaluate their performance using measuring instruments. **Values**: Promote accuracy and discipline in practical design and analysis.	Calculating the voltage gain of a common source circuit	P	
10	**4T**	**Knowledge**: Understand the operating principle of multistage amplifiers and the effects of cascade on gain and bandwidth. **Skills**: Analyze and design multistage amplifiers to achieve higher gain or better frequency response. **Values**: Develop an engineering sense for improving amplifier performance and reducing distortion.	Multistage amplifiers and cascaded amplifiers.	T	Tests and Reports
	3P	**Knowledge**: Identify the types of interconnections between stages (resistive, capacitive, direct) and their impact on performance. **Skills**: Use simulation and measurement to evaluate the performance of each stage and its role in the overall system. **Values**: Commitment to precision in designing and implementing series	multistage amplifiers	P	

		circuits to achieve effective results.			
11	**4T**	**Knowledge**: Understand the operating principle of differential amplifiers and their importance in amplifying analog signals. **Skills**: Analyze and design differential amplifier circuits using BJTs or FETs. **Values**: Promote critical thinking in signal processing and noise filtering.	Differential amplifiers.	T	Tests and Reports
	3P	**Knowledge**: To understand the properties of symmetry, common-mode rejection ratio (CMRR), and their range of applications. **Skills**: To measure differential gain and common-mode rejection and interpret the results practically. **Values**: To appreciate the role of differential amplifiers in microelectronic systems.	Differential amplifiers.	P	
12	**4T**	**Knowledge**: Identify the operating characteristics of each class (A, B, AB, and C) of amplifiers. **Skills**: Analyze the performance of different class amplifiers in terms of gain, efficiency, and distortion. **Values**: Develop the ability to balance performance and efficiency in selecting the appropriate design.	Power Amplifiers: Class A, B, AB, and C power amplifiers	T	Tests and Reports
	3P	**Knowledge**: Understanding the	Class A and B amplifiers	P	

		relationship between efficiency, distortion, and conduction angle in each class. **Skills**: Design and test amplifier circuits in practice and determine the appropriate class for the application. **Values**: Commitment to quality and accuracy in evaluating the practical performance of amplifiers.			
13	**4T**	**Knowledge**: Understand the impact of low-frequency inputs on the performance of BJT and FET amplifiers. **Skills**: Analyze frequency response curves of amplifiers at low frequencies. **Values**: Understand the importance of frequency response in improving signal quality and audio applications.	Low frequency response BJT and FET amplifiers.	T	
	3P	**Knowledge**: Understand the role of capacitors and time elements in determining low-frequency response. **Skills**: Design amplifier circuits that take into account low-frequency limits and filter factors. **Values**: Enhance precision in selecting component values to achieve the desired performance at low frequencies.	Low frequency response BJT	P	
14	**4T**	**Knowledge**: Understanding the impact of high frequencies on the performance of BJT and FET amplifiers.	High frequency response BJT and FET amplifiers.	T	

		Skills: Analyzing and designing amplifier circuits capable of operating efficiently at high frequencies. **Values**: Commitment to design precision to achieve high-frequency signal stability and quality.			
	3P	**Knowledge**: Identify the factors that affect the stability and response of amplifiers at high frequencies. **Skills**: Use measurement tools to simulate and evaluate the high-frequency performance of amplifiers. **Values**: Develop an awareness of the importance of frequency control in advanced applications.	High frequency response BJT	P	
15	**4T**	**Knowledge**: Understanding the behavior of BJT and FET amplifiers at low and high frequencies. **Skills**: Analyzing and designing amplifiers that take into account the full frequency response. **Values**: Enhancing precision in tuning circuit components to achieve optimal performance.	Review of BJT and FET low and high frequency response amplifiers.	T	
	3P	**Knowledge**: Identify the factors affecting frequency limits and frequency response. **Skills**: Use simulation and instrumentation to measure and evaluate the frequency performance of	Calculating bandwidth	P	

		amplifiers. **Values**: Develop a practical understanding of the importance of frequency response in signal quality and amplification.			

11.Course Evaluation	
The grades:	
Coursework	10
Practical	10
Midterm Exam	30
Final Exam	50
Total	100

12.Learning and Teaching Resources	
Required textbooks (curricular books, if any)	Electronic Devices and Circuit Theory Electronic Principles
Main references (sources)	Analysis and Design of Analog Integrated Circu Microelectronic Circuits
Recommended books and references (scientific journals, reports...)	
Electronic References, Websites	https://www.electronics-tutorials.ws https://www.allaboutcircuits.com https://circuitdigest.com