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

Academic Program and Course Description Guide

2026-2025

Republic of Iraq

Ministry of Higher Education Scientific Research

Supervision and Scientific Evaluation Directorate

Quality Assurance and Academic Accreditation Dept .

Academic Program Specification form

For Technical Colleges and Institutions

For Academic Year 2025-2024

University: Nathen Technical University

Collage /Institute: Mosul Technical Institute

Department: Electrical Techniques Dept.

Date of Completion: / /

Dr. Hassan Messar Qassim

Assistant Dean for Scientific Affairs

Date:// 1 / 09 /2025

Signature:

Dr. Raghad Ghalib Alsultan

Head of Electrical Tech.

Reviewed by: Ms. Ehsan Mohammed Ali

Quality Assurance and University Performance Manager

Date:

Signature:

Dr. Abd Alnaser A. Ahmad

Dean of Mosul Technical Institute

Date:

Signature:

The Academic Program Specification

This program briefly summarizes the most important features and what expected learning outcomes for students to achieve and demonstrates whether the students have satisfied the maximum benefits from the available opportunities. It is accompanied by a specification of each course within this program.

Educational Foundation	Northern Technical University
University College\ Institute	Mosul Polytechnic College
Academic Program Title	Electrical Techniques Department
Certificate Title	Technical Diploma in electrical
Academic Education System	Modules based
Accreditation	The institute is in the process of fulfilling accreditation from the ABET organization
Other External Influences	The Mosul Polytechnic College is mainly related to the General Directorate of Vocational Education as the primary beneficiary. Hence, it works on establishing new specializations and developing its curriculum to integrate with those of the Mosul Polytechnic College. This is to ensure that learning outcomes match the job market requirements. The department also serves the community, and students actively participate in these efforts.
Date of Preparing This Form	2025/9/1
Date of the fill this form	2025/9/1

1) Program Vision:

The Department of Electrical Engineering is a scientific and civilizational radiation center in the field of preparing specialized and practical cadres

that meet the needs of the local and global community in the fields of electricity generation, transmission, and distribution (the branch of electrical networks) as well as in industrial fields (the branch of electrical (power

The department prepares and graduates skilled and professional technicians in their field with a high degree of scientific, intellectual, and engineering excellence in the specialization of electrical engineering in its two branches (power and networks). It keeps pace with advanced technologies in educational curricula and courses, especially in the field of computer applications and the use of modern advanced applications in the fields of electrical engineering, engineering graphics, computer-assisted project presentation, and developing students' skills in this field.

2) Program Message :-

The establishment of a base of creative scientific cadres through the graduation of technicians with good competencies in the field of advanced electrical technologies after completing the application, to be capable of teaching in higher institutes, managing scientific laboratories, and working in power distribution stations, so that the graduated electrical technical cadres can meet the needs of the community they serve in line with the educational organization's vision in the scientific field. The department's message is defined by preparing responsible technical cadres for the maintenance and sustainability of factories and stations with academic knowledge and practical skills for generating, transmitting, and distributing electrical energy, and carrying out their effective role in nation-building through developing competency roles through research and scientific and field studies to be ready to continue and enhance the database and the high national belonging spirit and the ability to absorb international developments in the field of electricity and benefit from them.

3) Academic Program Objectives

1. Working on creating a suitable academic environment to prepare technical personnel specializing in electrical power and networks, enabling them to work efficiently in all department laboratories and workshops. They graduate from the department after completing two academic years, including summer training, to obtain a Technical Diploma in Electrical Technologies.
2. Qualifying department students to be familiar with both the theoretical and practical aspects of all study subjects, including the ability to work with modern technologies used in the field of electricity.

3. Developing their capabilities in the field of electrical technologies and researching modern topics to provide a knowledge base on the nature of electrical circuit connections, operation of electrical units in power generation, transmission, and distribution stations, and diagnosing problems that require further in-depth scientific research. This also includes equipment maintenance and installation of various electrical systems.
4. Developing the curriculum to align with the job market and providing quality services to the community by enhancing relationships with both private and government sectors.
5. Preparing and equipping students to play their role in the field of electrical engineering.
6. Working on fostering distinctive personal growth in students through cultural and social awareness development, enabling them to contribute effectively to their communities.

5) Program accreditation:

Not found.

6) Program structure

notes	Percentage	number Units	Name of course	
Basic and elective course		18	10	University requirments
		19	8	Institute requirments
		84	20	Department requurements
			1	Summer training
				other

7) Program description:

Electrical Department / First Level							
Icon	**Grader If any**	**Number Units**	**Number of Hours**		**Course Name**		**Type of Requirement**
			Practical	**Theoretical**	**In English**	**In Arabic**	
NTU100	-	2	0	2	Human Rights	حقوق الانسان والديمقراطية	University Requirements Count10 (8 Compulsory Unit + 2 Optional Unit)
NTU101	-	2	0	2	English Language	لغة إنكليزية	
NTU102	-	2	1	1	Computer Principles	الحاسوب	
NTU103	-	2	0	2	Arabic Language	لغة عربية	
NTU104	-	2	1	1	Sport	رياضية (اختياري)	
NTU106	-	2	1	1	French Language	اللغة الفرنسية (اختياري)	
MTI100	-	2	0	2	Mathematics	الرياضيات	Institute Requirement 10 Compulsory Unit
MTI101	-	3	3	0	Mechanical Workshop	معامل ميكانيك	
MTI102	-	3	3	0	Engineering Drawing	الرسم الهندسي	
MTI103		2	0	2	Calculas	التفاضل والتكامل	
ELT100	-	4	2	2	D.C. Circuits	دوائر التيار المستمر	Department specialized requirements 37 Unit (33 Compulsory Units +4 Optional Units)
ELT101	-	4	2	2	Electronic Principles	مبادئ الكترونيك	
ELT102	-	4	2	2	Electrical Installations	التأسيسات الكهربائية	
ELT104	-	5	5	0	Electrical and Electronic Workshop	معامل كهرباء والكترونيك	
ELT105	-	4	2	2	A.C. Circuits	دوائر التيار المتناوب	
ELT106	-	4	2	2	Electronic Circuits	دوائر الكترونيك	
ELT107	-	4	2	2	Digital Electronics	الالكترونيك الرقمي	
ELT108	-	4	2	2	Renewable Energy	طاقة متجددة	
ELT109	-	4	2	2	Machine Principle	مبادئ ميكانيك	
ELT110	-	4	2	2	Electrical Circuit Simulation	محاكاة دوائر كهربائية (اختياري)	
55 وحـدة						**مجموع الوحدات الكلية المطلوبة**	

Electrical Department/ Second Level							
الرمز	الممهد ان وجد	عدد الوحدات	الساعات الدراسية		أسم المقرر		نوع المتطلب
			ع	ن	باللغة الانكليزية	باللغة العربية	
NTU200	-	2	0	2	English Language	اللغة إنكليزية	University requirements: 10 compulsory units
NTU201	-	2	1	1	Computer Principles	الحاسوب	
NTU202	-	2	0	2	Arabic Languge	اللغة العربية	
NTU203	-	2	0	2	Crimes of Ba'ath party in Iraq	جرائم حزب البعث في العراق	
NTU204	-	2	0	2	Professional Ethics	اخلاقيات المهنة	
MTI200	-	2	2	0	Recerch Project	مشروع بحث	Institute Requirement 9 Compulsory Unit
MTI201	-	3	3	0	Specielized Workshope	ورشة تخصصية	
MTI203	-	2	2	0	Aplication Project	مشروع تطبيقي	
MTI203	-	2	0	2	Vocatinal Safety	السلامة المهنية	
ELT200	-	5	3	2	D.C Machines	مكائن التيار المستمر	Department specialization requirements: 43 units Compulsory (41 Units + 2 Optional Units)
ELT201	-	5	3	2	Power Electronics	الكترونيات القدرة	
ELTP202	-	4	2	2	Electrical Power Grids	شبكات القدرة الكهربائية	
ELTP203	-	4	2	2	Industrial Electrical Installations	التأسيسات الكهربائية الصناعية	
ELTP205	-	3	3	0	Electrical Drawing	الرسم الكهربائي	
ELT206	-	4	2	2	A.C Machines	مكائن التيار المتناوب	
ELT207	-	5	3	2	Power Electronics Applications	تطبيقات الكترونيات القدرة	
ELT208	-	4	2	2	Installation Industrial and Control Systems	نظم سيطرة صناعية	
ELT209	-	4	2	2	Electrical Transmission Networks	شبكات النقل الكهربائية	
ELT210	-	3	2	1	Programmable Logic Controllers (PLC)	المتحكمات المنطقية المبرمجة	
ELT211	-	2	1	1	Power System Protiction	حماية أنظمة القدرة	

ELT212	-	3	2	1	Microcontroller	المتحكمات الدقيقة (اختياري)	
62 وحدة					مجموع الوحدات الكلية المطلوبة		

8) Required Program Outcomes and Methods of Teaching, Learning, and Assessment:

A. Cognitive Objectives:

1. Aiming to understand the general principles of electricity, such as knowledge of basic electrical quantities: voltage, current, power, and electrical energy.
2. Aiming to understand electronic elements and circuits, amplifiers, and industrial control.
3. Aiming to understand the operation of electrical machines: direct current and alternating current generators, as well as single-phase and three-phase transformers.
4. Aim to understand the types of motors, their maintenance, and operating principles.
5. Aiming to understand the types of power generation stations and methods of electricity transmission and distribution.
6. Aiming to understand secondary station components and installations, overhead transmission lines, and cables.
7. Aiming to understand electrical loads, load factor, demand factor, base load, peak load, station interconnection, how to draw load curves, and how to calculate kilowatt-hour costs.
8. Aiming to understand the principles of designing electrical and residential installations for residential buildings and calculating quantities and materials preparation for installation work and control and regulation arrangements.
9. Aiming to understand the recent developments in representing complex electrical circuits using logic controllers and Arduino.
10. Understanding computer applications, especially in implementing electrical diagrams and designs.

B. Skills Objectives Specific to the Program:

1. Learning to install and operate electrical machines and equipment for power generation, transmission, and distribution.
2. Maintaining and rewinding all types of motors.
3. Extending and maintaining power transmission system.
4. Installing and operating electrical measurement devices.
5. Executing electrical and industrial installations in residential buildings and other institutions.
6. Dealing with electrical circuits using logic controllers.

7. Operating and maintaining protection and control devices for the electrical power system.
8. Implementing electrical designs using computers.
9. Supervising occupational safety requirements in educational workshops and laboratories.
10. Equipping students with the skill to diagnose electrical faults and solve practical problems in electrical networks.

Methods of Teaching and Learning:

1. Developing curricula that are compatible with internationally recognized curricula.
2. Sending students for training at power stations and departments affiliated with the Ministry of Electricity to gain practical experience.
3. Updating the study materials to keep pace with developments.
4. Hands-on work in laboratories and workshops.
5. Project execution by students.
6. E-learning.
7. Graduation projects in both theoretical and practical phases.

Methods of Assessment:

1. Theoretical and practical exams.
2. Preparing and discussing reports.
3. Non-exam activities and homework.
4. Discussion of graduation projects.

C. Ethical and Values Objectives:

1. The ability to teach and train vocational education students.
2. Student interaction with each other and with academic material.
3. Guiding students to care for and maintain the department's assets and the institute.
4. Developing research skills using the Internet for students.
5. Preparing qualified technical personnel for various private and public sector companies.
6. Preparing specialists in equipment maintenance by providing students with practical skills.
7. Offering solutions to problems faced by institutions and relevant departments in the field of electricity.
8. Working towards providing job market requirements and enhancing economic capacity.

Teaching and Learning Methods:

1. Utilizing modern tools and methods for student education and training.
2. Organizing discussion sessions during lectures to address academic topics.

3. Applying theoretical concepts practically in various labs and educational workshops.
4. Assigning non-graded tasks to students.
5. Conducting scientific visits and summer training programs.
6. Supervising and supporting graduation research projects.

Assessment Methods:

1. Daily attendance and commitment, daily quizzes.
2. Monthly and final exams (theoretical and practical).
3. Classroom participation through academic discussions.
4. Non-graded assignments and weekly reports on practical experiments conducted by students.
5. Practical tests based on experiments related to theoretical subjects.

D. General and Transferable Skills (Other Skills Related to Employability and Personal Development):

1. Skills in representing electrical circuits and solving them using modern software.
2. Skills in electrical equipment maintenance and repair.
3. Communication, computer, and internet skills, as well as presentation skills.
4. Skills in creating electrical diagrams using computer software.
5. Self-learning and self-reliance skills.
6. Teamwork skills.
7. Skills to enable students to pass job interviews.
8. Distance learning skills.

Teaching and Learning Methods:

1. Developing curricula compatible with international standards.
2. Sending students for training at power stations and government electrical departments to gain practical experience.
3. Updating the study material to keep pace with developments.
4. Practical work in labs and workshops.
5. Training in presentation and communication skills.
6. Theoretical and practical lectures.
7. Student projects.
8. E-learning.

9) Teaching and learning strategies

10) Academic staff

No.	NAME	Academic title	degree
1.	Dr. Raghad Ghalib Alsultan	Lecturer	Electrical Engineering
2.	Dr. Ahmed Ateya Allu	Asst. Prof	Electrical Engineering Power and Machines
3.	Shatha yousif Ismail	Asst. Prof	Electrical engineering
4.	Zozan Saadallah Hussain	Lecturer	M.Sc. in Electrical Power Technology Engineering
5.	enaam mohammed jaber	Lecturer	electrical engineer-ing/power and machine
6.	zahra Mohammed SaeeD	Lecturer	Science Physics Lecturer
7.	Zeena Tariq Abdul Rah-man	assistant Lec-turer	Physics Sciences
8.	Firas Saaduldeen Ahmed	assistant Lec-turer	M.Sc. in Electrical Power Technology Engineering
9.	Dawood Salim Moham-med	assistant Lec-turer	Electronics Engineering
10	Layth Abduljabbar Hamdi	assistant Lec-turer	Electrical Power Tech-niques Engineering
11	Karam Sameer Qasim	assistant Lec-turer	Electrical and Electronics Engineering
12	Israa khalouq saeed	assistant Lec-turer	Electrical Engineering Power and Machines
13	Mohammed Bashar Se-deeq	assistant Lec-turer	Electrical Engineering Power and Machines
14	Ibrahim Ahmed Moham-med	assistant Lec-turer	Electrical engineering / power and Machine
15	Safaa Abdul-Jabbar Yussuf	assistant Lec-turer	electrical engineer-ing/power and machine
16	zaid khalaf mohammed	assistant Lec-turer	Electrical Engineering-Electrical and Electronics Engineering

11.Personal Development Planning:

Continuous planning is carried out to enhance the academic and administrative progress of the educational program. The procedures include:

1. Developing students' research and inquiry skills by encouraging them to participate in modern discussion groups, seminars, and lectures related to the field.
2. Encouraging students to explore various sources, books, and journals for information.
3. developing the skills of faculty members and technicians through their participation in training programs and workshops within or outside the university.
4. Technicians and staff participation in developmental courses within higher education institutions or elsewhere.
5. Organizing conferences, participating in scientific seminars, and hosting discussion groups for students.
6. Staying updated with the latest scientific developments in the field.
7. Conducting individual or collaborative research (applied or theoretical).

12) Acceptance standard

1-through the mechanisms and conditions of central admission approved by the ministry of higher education and scientific research

2-accepting students for professional studies specializing in electricity according to central controls

13) Admission Criteria (Establishment of Regulations for Enrollment in the College or Institute):

1. Admission is based on centralized admission procedures and conditions approved by the Ministry of Higher Education and Scientific Research.
2. Acceptance of professional study students specializing in electrical engineering is governed by central regulations.

14.Key Information Sources about the Program:

1. Department Email: elt.mti@ntu.edu.iq.
2. Current study curriculum, surveys, and market needs.
3. Central library at the institute.
4. Decisions and recommendations from academic committees, department councils, the institute, the university, and the ministry.
5. Department's webpage on the institute and university websites.
6. Northern Technical University Guide.
7. Experiences of Arab and international universities.

8. Specialized seminars and workshops with relevant stakeholders.
9. Personal Experiences.
10. The Internet and Social Media.

Curriculum Skills Chart																		
Please mark the checkboxes corresponding to the individual learning outcomes of the program subject to evaluation																		
Required Learning Outcomes from the Program																		
General and Transferable Skills (Other Employability and Personal Development Skills					Ethical and Values-based Objectives				Program-specific Skill Objectives				Cognitive Objectives			Core or Elective	Module Name	Module Code	Year / Level
d4	d3	d2	d1	c4	c3	c2	c1	b4	b3	b2	b1	a4	a3	a2	a1				
√	√	√	√	√	√	√	√		√	√	√	√	√	√	√	Core	Human Rights	NTU100	1st Level
					√	√	√		√	√	√	√	√	√	√	Core	Democracy	NTU106	
							√			√	√	√	√	√	√	Core	English Language	NTU101	
			√				√		√		√			√	√	Core	Computer Principles 1	NTU102	
		√			√	√	√		√	√	√		√	√	√	Core	Computer Principles 2	NTU103	
				√	√		√		√	√	√		√	√	√	Core	Arabic Language	NTU104	
			√	√		√	√		√	√	√		√	√	√	Core	Sport	NTU105	
																	French Language	NTU107	
																	Mathematic 1	TIMO110	
																	Mechanical Workshop	TIMO111	
																	Mathematic 2	TIMO112	
																	D.C. Circuits	ELT100	
																	Electronic Principles	ELT101	
																	Electrical Installations Technology	ELTP102	
																	Engineering	ELT103	

																Drawing		
																Electrical Workshop	ELT104	
																A.C. Circuits	ELT105	
																Electronic Circuits	ELT106	
																Digital Electronics	ELT107	
																Vocational Safety	ELT109	
																Renewable Energy	ELT110	
																Electrical Circuits Simulation	ELT111	
																English Language	NTU200	2nd Level
																Professional Ethics	NTU201	
																D.C Machines	ELT200	
																Power Electronics	ELT201	
																Electrical Power Grids	ELTP202	
																Industrial Electical Installations	ELTP203	
																Electric Workshop	ELTP204	
																Electrical Drawing	ELTP205	
																Project1	ELT206	
																A.C Machines	ELT207	

																Power Electronics Applications	ELT208	
																Electrical Transmission Networks	ELTP209	
																Industrial Installation and Control Systems	ELTP210	
																Electrical Maintenance Workshop	ELTP211	
																Programmable Logic Controllers (PLC(	ELT212	
																Project 2	ELT213	
																Fundamentals of Protection Systems	ELTP214	
																Microcontrollers	ELTP215	

Appendix for Objectives of Some Academic Subjects

Electrical Circuits:

Cognitive Objectives:

1. Identify the method of connecting electrical circuits and how they operate.
2. Understand the theories related to solving electrical circuits.
3. Recognize alternating and direct current circuits.
4. Identify different types of circuit connections.

Skills Objectives:

1. Measure electrical quantities using various devices.
2. Learn to apply various theories to solve electrical circuits.
3. Acquire the skill of designing electrical circuits.
4. Develop the ability to detect faults in electrical circuits.

Electronics:

Cognitive Objectives:

1. Identify laboratory equipment.
2. Understand the connection methods for electronic components.
3. Recognize circuits that convert alternating current to direct current.
4. Identify different types of electrical waves.

Skills Objec-
tives:

1. Learn how to work with electrical circuits.
2. Acquire skills related to different electronic theories.
3. Learn the different types of biasing for various components.
4. Master signal amplification techniques and their various applications.

Electrical Machines:

Cognitive Objectives:

1. Identify various types of electrical machines.
2. Understand the theory of operation of generators and electric motors.
3. Recognize winding methods used with electric motors.
4. Understand the properties of different machines and influencing factors.

Skills Objectives:

1. Learn how to operate various electrical machines and connect them.
2. Acquire skills in series, parallel, and mixed machine connections.
3. Learn the process of synchronization between different machines.
4. Learn to draw curves related to the properties of each electrical machine.

Human Rights and Democracy:

Cognitive Objectives:

1. Define human rights for students.
2. Explain public and private freedoms.
3. Define intellectual, cultural, journalistic, economic, and social freedoms.
4. Explain the concept of democracy.

Conscience Objectives:

1. Learn about individual human rights.
2. Promote self-learning.
3. Encourage participation in collective work and voluntary contributions.
4. Enhance human behavior in respecting the rights of others and building personal, national, regional, and international relationships.

These objectives provide a clear framework for the expected knowledge and skills that students should gain from each subject.

Power Electronics:

Cognitive Objectives:

1. Identify the types of rectifiers for full-wave and half-wave rectification.
2. Understand the representation of thyristors using transistors.
3. Recognize other components and types of thyristors and their uses in electrical circuits.
4. Understand the triggering and commutation methods of thyristors.
5. Identify choppers and inverters circuits.

Skills Objectives:

1. Teach students how to connect and represent components in electrical circuits.
2. Aim to develop students' skills in triggering and commutation of thyristors using various methods.
3. Focus on teaching students the skill of using thyristors or their other types in various electrical applications.
4. Help students learn to work with choppers and inverters circuits in different electrical circuits.

Electric Power System:

Cognitive Objectives:

1. Identify methods for generating electrical energy and transmitting it over long distances.
2. Understand the means of electrical energy transmission.
3. Recognize different types of substations and their operation.
4. Know how to protect transmission lines from faults.
5. Understand the methods of distributing electrical energy to consumers.

6. Identify types of underground cables and their applications.

Skills Objectives:

1. Teach students the skill of drawing an electric power system from generation to consumer areas.
2. Help students learn the skill of classifying overhead transmission lines into short, medium, and long.
3. Develop the skill of representing overhead transmission lines using resistors, inductors, and capacitors.
4. Teach students the skill of calculating capacitance for single and three-phase systems with three wires.
5. Help students learn the skill of classifying underground cables based on various factors such as insulation type, conductor shape, and transmitted voltage.
6. Teach students the skill of using various relays in protecting transmission and distribution systems.

These objectives provide a clear outline of what students are expected to know and the skills they should acquire in these subjects.

Module Description Template

This module description provides a concise summary of the most important characteristics of the course and the expected learning outcomes for students to achieve. It demonstrates whether the student has maximized the benefits of the available learning opportunities. It should be linked to the program description.

1. **Educational Foundation**	Northern Technical University
2. **University College\ Institute**	Mosul Polytechnic College
3. **Academic Program Title**	Electrical Techniques Department
4. **Module Name**	Electrical Machines
5. **Available Attendance Formats**	Mandatory
6. **Course \ Year**	Module-based
7. **Total Credit Hours**	5*15 weeks= 75
8. **Date of preparing this program**	27/10/2025

9. Modules Objectives

1. Provide students with fundamental knowledge about electrical machines.
2. Provide and introduce students to both AC and DC electrical machines.
3. Educate and familiarize students with the components and operation of electrical machines and transformers.
4. Provide students with comprehensive information about various types of electrical machine connections.

10. Required Course Outcomes and Teaching, Learning, and Assessment Methods

A. Cognitive Objectives:

1. Enable students to connect various types of electrical machines.
2. Empower students with the knowledge of electrical transformers' components and assembly.
3. Enable students to conduct inspections on electrical machines.
4. Empower students to create curves specific to practical experiments.

B. Skill-Based Objectives for the Course:

1. Learn the installation and operation of electrical machines in their various types.
2. Inspect and test electrical machines.
3. Inspect and test electrical transformers.
4. Calculate currents and loads.

5. Understand different types of loads.
6. Equip students with the skill to diagnose electrical faults and solve practical problems in electrical networks.
7. Supervise occupational safety requirements in the laboratory.

Teaching and Learning Methods:

1. Theoretical lectures and practical training in laboratories, discussions, and dialogues
2. Application of the studied topics in theory on a practical level in various educational laboratories.
3. Field visits to power generation, transmission, and distribution stations throughout the academic year.
4. Presentation of scientific films during classroom sessions.

Assessment Methods:

1. Feedback (Testing students on the previous material), Self-assessment (Questions are provided to students by the instructor, and students answer them, while the instructor also provides answers, and students evaluate themselves based on the instructor's responses).
2. Daily written tests, and weekly reports on the practical experiments conducted by the student in the laboratory.
3. Commitment to assignments, attendance, and obligations.
4. Monthly and final exams (both theoretical and practical).
5. Classroom participation through discussions on study topics.
6. Continuous assessment of practical performance by the student in the labs.

C. Ethics and Values-Based Objectives:

1. Prepare specialized personnel for maintenance work on various types of machines by equipping students with practical skills.
2. Develop solutions for problems faced by institutions and relevant departments in the field of electricity.
3. Prepare specialized personnel for maintenance work on various types of machines.
4. Teach students methods of protecting electrical machines.
5. Foster interaction among students and with the academic material.
6. Guide students to take care of laboratory equipment and departmental assets.
7. Understand how to read the specifications for each electrical machine.

Teaching and Learning Methods:

1. Apply the theoretically studied topics at a practical level in educational laboratories.

2. Write reports and discuss the results of each experiment.
3. Surprise tests.
4. In-class and homework assignments.
5. Scientific visits to power stations.

Assessment Methods:

1. Practical examinations based on experiments related to theoretical subjects.
2. Reports on developments in the field of specialization, directing analytical and inferential questions.
3. Oral and practical exams.

D. General and Qualifying Skills (Other Skills Related to Employability and Personal Development):

1. Skills in the field of maintenance and repair of electrical appliances.
2. Field visits to gain experience from others.
3. Stay informed about the latest developments in the field of specialization (educational videos).
4. Self-learning skills and self-reliance.
5. Practical training at power stations and electrical departments.
6. Teamwork skills.

Teaching and Learning Methods:

1. Provide students with fundamentals through theoretical lectures for each subject.
2. Send students for training in power stations and government electrical departments to gain real-world experience.
3. Update the curriculum to keep up with developments.
4. Work in laboratories and workshops.
5. Questions that encourage critical and analytical thinking.
6. Execution of projects by students.

Assessment Methods:

1. Theoretical and practical exams.
2. Completion of reports and their discussion.
3. Non-class activities and homework.
4. Discussion of graduation projects.

11.Course Structure

Evaluation method	Method of education	Unit / Subject Name	Required Learning Outcomes	Hours	The week
Test	Lecture, discussion, feedback, poster presentation, video and film presentation, practical training	DC Machines	Basic principles of DC machines – main parts of machines – magnetic poles– product–external structure.	5	1
Test	Lecture, discussion, feedback, poster presentation, video and film presentation, practical training	DC Machines	Production member coils - ripple winding - thousand non-single multipliers. Give computational and applied examples to know how to calculate The value of lines and how to apply them when performing the winding process, feed coils - current collector	5	2
Test	Lecture, discussion, feedback, poster presentation, video and film presentation, practical training	DC Machines	Types of DC machines (succession - parallel - compound) separate feeding - self-feeding. DC losses. Fixed Joints – Variable Phases of Power Distribution in Generators Continuous. efficiency and give mathematical examples of how to calculate Lost.	5	3

Test	Lecture, discussion, feedback, poster presentation, video and film presentation, practical training	DC Machines	Electromotive force – factors affecting the voltage of the generator give mathematical examples of how to calculate the emf For all types of generators.	5	4
Test	Lecture, discussion, feedback, poster presentation, video and film presentation, practical training	DC Machines	-Magnetic curve (no load(	5	5
Test	Lecture, discussion, feedback, poster presentation, video and film presentation, practical training	DC Machines	Load Profile Curve – Voltage regulation of different types of generators – External properties– Internal properties.	5	6
Practical test	Lecture, discussion, feedback, poster presentation, video and film presentation, practical training	DC Machines	Product reaction and its effect on pregnancy and explain ways to reduce the provocation of the product's reaction – orthogonal amperes– Give computational examples of compensatory files.	5	7
Test	Lecture, discussion, feedback, poster presentation, video and film presentation, practical training	DC Machines	Commutation and influence it Improving the process of resistance consolidation and uniformity of driving force	5	8

			Electrical – interstitial electrodes.		
Test	Lecture, discussion, feedback, poster presentation, video and film presentation, practical training	DC Machines	Running parallel DC generators. The reasons for running DC generators in parallel. Conditions for operating DC generators in parallel. distribution of load on generators in parallel and giving mathematical examples	5	9
Test	Lecture, discussion, feedback, poster presentation, video and film presentation, practical training	DC Machines	DC motors Motor Theory – Reverse Electromotive Force Motor voltage equation – comparison between DC motors and generators.	5	10
Test	Lecture, discussion, feedback, poster presentation, video and film presentation, practical training	DC Machines	Torque – Production member torque – drive shaft torque Power distribution in motors State stages at the greatest output power	5	11
Test	Lecture, discussion, feedback, poster presentation, video and film presentation	DC Machines	General properties of speed and torque of successive, parallel and vehicle engines. Speed regulation rate Computational examples – compari-	5	12

			son of engines in different industrial applications.		
Test	Lecture, discussion, feedback, poster presentation, video and film presentation	DC Machines	Starting the movement – the importance of starting the movement Three-point initiator – Simple starter design– Arithmetic examples.	5	13
Test	Lecture, discussion, feedback, poster presentation, video and film presentation	DC Machines	Control the speed of DC motors. -1Speed regulation by voltage. -2Speed regulation by field. Arithmetic examples.	5	14
Practical test	Lecture, discussion, feedback, poster presentation, video and film presentation, practical training	DC Machines	Reverse the direction of rotation of the machine. Ways to stop engines. Dynamic Stop – Inverter Stop – Regeneration Stop.	5	15
Practical test	Lecture, discussion, feedback, poster presentation, video and film presentation, practical training	AC Machines	Motor Testing Stop Test – Sunbun Test Hopkinson test – decreasing test – arithmetic examples.	5	16
Practical test	Lecture, discussion, feedback, poster presentation, video and film presentation, practical training	AC Machines	Electrical transformers / transformer components and parts Operating theory (Transformer with inner core –	5	17

			transformer with outer core Equation of electro-motive force - vec-tor drawing - trans-former equivalent circuit.(		
Test	Lecture, discussion, feedback, poster presentation, video and film presentation, practical training	AC Machines	Open circuit and cabin test – and how to calculate the value of equivalent circuit components – transferred from the load state– Phase diagram of the transformer in case of pregnancy – losses – calculation of efficiency case of maximum efficiency – miscellaneous is-sues	5	18
اختبار	Lecture, discussion, feedback, poster presentation, video and film presentation, practical training	AC Machines	Self-transformer – Issues. Current transformer – voltage trans-former – scientific uses	5	19
Test	Lecture, discussion, feedback, poster presentation, video and film presentation, practical training	AC Machines	Three-phase trans-formers. Different ways to connect triple trans-formers – problems.	5	20
test	Lecture, discussion, feedback, poster presentation, video and film presentation, practical training	AC Machines	Three-phase induc-tion transformers. Advantages – Disad-vantages – Rotating Magnetic Field – Theory of Operation	5	21

			Slip – Rotor Frequency		
Practical test	Lecture, discussion, feedback, poster presentation, video and film presentation, practical training	AC Machines	Types of engines Squirrel cage engines. Sliding motors. Comparison between them - the composition of each type - the uses of each type.	5	22
Practical test	Lecture, discussion, feedback, poster presentation, video and film presentation, practical training	AC Machines	Startup control methods. Operation by Star Switch – Delta – Operation using by connecting the resistor in the rotor circuit.	5	23
Practical test	Lecture, discussion, feedback, poster presentation, video and film presentation, practical training	AC Machines	The relationship between torque and power factor. The relationship between torque and slippage. Torque – requirement for maximum starting torque. Torque – maximum torque requirement g Induction motor parabolic circuit – mathematical examples.	5	24
Practical test	Lecture, discussion, feedback, poster presentation, video and film presentation	AC Machines	Reverse the direction of rotation of three-phase induction motors.	5	25

			Methods of stopping induction motors – control of induction motors using: Source voltage - number of poles - source frequency - resistance position in the rotor circuit - operation of two motors Respectively.		
Practical test	Lecture, discussion, feedback, poster presentation, video and film presentation	AC Machines	Single-phase induction motors – types – installation Theory of operation - how to obtain an initial torque - a detailed explanation of the types of induction motors: -1Split-phase induction motor. -2Induction motor with wide-starting capacity. -3Induction motor with wide start and rotation. -4Shaded pole induction motor. -5Altenverous motor. -6General engine. Reverse the direction of rotation for each type.	5	26
Practical test	Lecture, discussion, feedback, poster presentation, video	AC Machines	Synchronous generators.	5	27

	and film presentation, practical training		Installation - principles of work - types of generators for the rotating member. Step coefficient – distribution coefficient. Equation of the electromotive force in the case of load (resistor - induction - capacitive) and draw the phase diagram for each Carrying voltage regulation rate – miscellaneous issues.		
Practical test	Lecture, discussion, feedback, poster presentation, video and film presentation, practical training	AC Machines	Comparison of DC and AC generators Reasons for making a product in synchronous generators Fixed running generators in parallel. Reasons and conditions for the operation of synchronous generators in parallel. Explanation of the synchronization process – voltage regulation rate – miscellaneous issues	5	28
Test	Lecture, discussion, feedback, poster presentation, video and film presentation	AC Machines	Synchronous motors Installation and principles of work in synchronous motors –	5	29

			Starting in synchronous motors– Synchronous motor in carrying state – phase scheme in case of unit power factor – Advanced power factor– Delayed power factor – calculation of the value of the reverse electromotive force.		
Test	Lecture, discussion, feedback, poster presentation, video presentation	AC Machines	Practical uses – regulation rate. Scheja Engine – Installation – Speed Regulation General review of AC motors	5	30

12.Infrastructure:

1. Prescribed Textbooks.
2. Primary References (Sources).

Recommended Books and References (Scientific Publications, Reports, etc. Electronic References, Websites, etc. There is a dedicated laboratory for the Electrical Machines course.

13.Curriculum Development Plan:

1. Participation in relevant scientific conferences.
2. Additional lectures by guest lecturers from outside the institution
3. Establishing relationships with other universities and corresponding colleges.
4. Holding extensive meetings between faculty members of all colleges and institutes of Northern Technical University to develop the curriculum.
5. Discussing the basics of the curriculum with students to identify its strengths and weaknesses.
6. Two-month summer training program with 300 training hours.

1-Digital Electronic

Hor/week			1st year	Digital Electronic
sum	theory	practical		
4	2	2		
				Engilish

Syllabus

Curriculum	Week
1 Number system \ 1.1 analogue versus digital \ 1.2 Introduction to number system \ 1.3 decimal number system \ 1.4 Binary number system \ 1.4.1 Advantages \ 1.5 Octal number system \ 1.6 Hexadecimal number system \ 1.7 Number system – some common terms \1.7.1 Binary number system \ 1.7.2 decimal number system \ 1.7.3 Octal number system 1.7.4 Hexadecimal	**1**
2 Binary codes \ 2.1 Binary coded decimal \ 2.1.1 BCD – To – Binary conversion \ 2.1.2 Binary – To - BCD conversion \ 2.1.3 Higher – density BCD encoding \ 2.1.4 Packed and unpacked BCD number \ 2.2 Excess-3 code \ 2.3 Gray code \ 2.3.1 Binary - Gray code conversion \ 2.3.2 Gray code - Binary conversion \ 2.3.3 Gray code	**2**
3 Digital Arithmetic \ 3.1Basic rules of Binary addition and subtraction \ 3.2 Addition OF Larger – bit Binary numbers \ 3.2.1 Addition using the 2's complement method \ 3.3 subtraction of Larger – bit Binary numbers \ 3.3.1 subtraction using 2's complement Arithmetic \ 3.4 BCD addition and subtraction in excess-3 code \ 3.4.1 Addition \ 3.4.2 Subtraction \ 3.5 Binary multiplication \ 3.5.1 Repeated left-shift and add algorithm \ 3.5.2 Repeated add and right- shift algorithm \ 3.6 Binary division \ 3.6.1 Repeated right- shift and subtract algorithm	**3**
4 Logic Gates and related devices \ 4.1 Position and negative Logic \ 4.2 Truth table \ 4.3 Logic Gates \ 4.3.1 OR Gate \ 4.3.2 AND Gate \ 4.3.3 NOT Gate \ 4.3.4 EXCLUSIVE-OR Gate \ 4.3.5 NAND Gate \ 4.3.6 NOR Gate \ 4.3.7 EXCLUSIVE-NOR Gate \ 4.3.8 INHIBIT Gate \ 4.4 Universal Gate	**4**
5 Logic families \ 5.1 Logic families – Significance and types \ 5.1.1 Significance \ 5.1.2 types of Logic family \ 5.2	**5**

Characteristic Parameters 1 \ 5.3 Transistor Transistor Logic (TTL)	
6 Boolean Algebra and simplification Techniques \ 6.1 Introduction to Boolean Algebra 189 \ 6.1.1 Variables, Literals and terms in Boolean Expressions \ 6.1.2 Equivalent and complement of Boolean Expressions \ 6.1.3 Dual of a Boolean Expressions \ 6.2 Postulates of Boolean Algebra \ 6.3 Theorems of Boolean Algebra	**6**
7 Arithmetic circuits \ 7.1 Combinational circuits \ 7.2 Implementing Combinational Logic \ 7.3 Arithmetic circuits – Basic Building blocks \ 7.3.1 Half-Adder \ 7.3.2 Full Adder \ 7.3.3 Half – Subtractor \ 7.3.4 Full Subtractor \ 7.3.5 Controlled Inverter \ 7.4 Adder – Subtractor 2	**7**
8- Multiplexers and Demultiplexers / 8.1 Multiplexer / 8.1.1 Inside the Multiplexer/ 801.2 Implementing Boolean Functions with Multiplexer/ 8.1.3 Multiplexers for parallel – to – Serial Data Conversion / 8.1.4 Cascading Multiplexer Circuits 280 / 8.2 Encoders / 8.2.1 Priority Encoder / 8.3 Demultiplexers and Decoders / 8.3.1 Implementing Boolean Functions with Decoders /8.3.2 Cascading Decoder Circuits	**8**
9- programmable Logic Devices Fixed Logic Versus programmable Logic / 9.1.1 Advantages and Disadvantages / 9.2 programmable Logic Devices- An Overview	**9**
10- Flip – Flops and Related Devices /10.1 Multivibrator / 10.1.1 Bistable Multivibrator/ 10.1.2 Schmitt Trigger / 10.1.3 Monostable Multivibrator /10.1.4 ASABLE Multivibrator /10 .2 Integrated Circuit (IC) Multivibrator / 10.2.1 Digital IC-Based Monostable Multivibrator /10.2.2 IC Timer- Based Multivibrator / 10.3 R-S Flip-Flop/ 10.3.1 R-S Flip-Flop with Active LOW inputs /10.3.2 R-S Flip-Flop with Active HIGH inputs / 10.3.3 Clocked R-S Flip-Flop	**10**
10.7.1 J-K Flip-Flop as D Flip-Flop/ 10.7.2 D Latch / 10.8 Synchronous and Asynchronous Inputs / 10.9 Flip-Flop Timing Parameters	**11**
12- Counters and Registers / 11.1 Ripple (Asynchronous) Counter / 11.1.1 propagation Delay in Ripple Counters/	**12**

11.2 Synchronous Counter / 11.3 Modulus of a Counter / 11.4 Binary Ripple Counter- Operational Basics / 11.4.1 Binary Ripple Counters with a Modulus of Lass than 2N / 11.4.2 Ripple Counters in IC form	
13- Counter s and Registers Syncgronous (or parallel) Counters / 11.6 UP/DOWN Counter /11.7 Decade and BCD Counters /11.8 presettable Counters	**13**
14- Data Conversion Circuits- D/A and A/D Converters / 12.1 Digital – to –Analogue Converters / 12.1.1 Simple Resistve Divider Network for D/A Conversion /12.1.2 Binary Ladder NETWORK for D/A Conversion /12.2 D/A Converter Specifications / 12.2.1 Resolution/ 12.2.2 Accuracy /12.2.3 Conversion Speed or Settling Time /12.2.4 Dynamic Range	**14**
15-Data Conversion Circuits – D/A and A/D ConverterS TYPES OF A/D Converter /12.3.1 Multiplying D/A Converters/ 12.3.2 Bippolar –Output D/A Converters/12.3.3 Companding D/A Converters TYPES OF A/D Converter	**15**

Practical

Syllabus	week
Introdution to Digital Electonics Lab – nomenclature of digital ICS. Specification . study of the data sheet . concept of vce and ground . Verification of the truth tables of logic gates using TTLICS	**1**
Implementation of the given Boolean function using logic in both sop and pos forms.	**2**
Verification of state tables of RS. JK .T and D flip –flops using NAND & nor gates	**3**
Implementation and verification of decoder / de- multiplexer and encoder using logic gates.	**4**
Implementation OF 4XI multiplexer using logic gates.	**5**
Implementation of 4-bit parallel adder using 7483 IC	**6**
Design and verify the 4-bit stnchronous counter.	**7**
Design and verify the 4-bit astnchronous counter.	**8**
To Design and verify operation of half adder and full adder.	**9**
To Design and verify operation of half subtractor	**10**
To Design and verify operation of magnitude comparator.	**11**
To study and verify NAND as auniversal gate.	**12**
To Design and implement de multiplexer .	**13**

To realiz Basic gates (AND,OR,NOR) fron Universal gates (NAND)	**14**
Design adder , subtractor circuit using a 4- bit adder IC.	**15**

3- Calculus

1- Course name	Calculus
2- Course Code	MTI103
3- Second Semester	Second2026-2025/
4- Course Description Date	**1/7/2025**
5- Available Attendance Formats:	-1)**.**Weekly Class Schedule (Theoretical 2-Discussions, Academic Seminars, and Other Extracurricular Activities
6- Number of Credit Hours/Units):)	2 x 15 Weeks = 30 / 2 Units 2 Theoretical
7- Name of Course Supervisor (List all names, if there is more than one)	Dr. Zahra Mohammed Saeed Ismail
8- Course Objectives:	
• General Objectives: Study the laws of how to solve differential equations and solve integration problems **.**	
Cognitive Objectives: The student will be able to: 1- Understand the laws and mathematical equations and solve differential equations and integration problems. 2- Apply the laws in differential and integral calculus applications.	
Course Skill Objectives: B1. Accuracy in applying mathematical equations B2. Aims to learn solutions to mathematical equations and perform measurements and applications in the field of electrical circuits. **Affective and Value-Based Objectives:** C1. Establish accuracy, discipline, and mastery in work (instilling professional ethics) C2. Develop responsibility and reliability C3. Promote a spirit of teamwork and cooperation **General and Transferable Skills (other skills related to employability and personal development(** D1. Analytical thinking and problem-solving skills D2. Accuracy and attention to detail D3. Occupational safety skills D4. Small business management	
9. Teaching and Learning Strategies	
((Preparatory lectures / Listening lectures / UAE emergencies / Interactive lectures / Library and internet research for specific topics))	

.10 Course structure

Week	Hours	Learning Outcomes	Unit / Topic Name	Teaching Method	Assessment Method
1	2h	Definition of function, importance of functions, non-algebraic functions	Chapter 1 / Functions	Lecture, discussion, feedback, Q&A, educational videos & films	Test + Homework
2	2h	Types of functions, exponential and logarithmic, defining the purpose	Chapter 1 / Types of Functions	Lecture, discussion, feedback, Q&A, educational videos & films	Test + Homework
3	2h	Calculating the purpose, understanding solution methods	Chapter 1 / Purpose	Lecture, discussion, feedback, Q&A, educational videos & films	Test + Homework
4	2h	Maximum and minimum limits	Chapter 1 / Limits	Lecture, discussion, feedback, Q&A, educational videos & films	Test + Homework
5	2h	Differentiation	Chapter 2 / Differentiation Rules	Lecture, discussion, feedback, Q&A, educational videos & films	Test + Homework
6	2h	Ordinary function derivatives	Chapter 2 / Vector Calculations	Lecture, discussion, feedback, Q&A, educational videos & films	Test + Homework
7	2h	Trigonometric function derivatives	Chapter 2 / Trigonometric Function Rules	Lecture, discussion, feedback, Q&A, educational videos & films	Test + Homework
8	2h	Derivatives of exponential & logarithmic functions	Chapter 2 / Exponential & Logarithmic Function Rules	Lecture, discussion, feedback, Q&A, educational videos & films	Test + Homework
9	2h	Implicit differentiation	Chapter 2 / Implicit Differentiation Rule	Lecture, discussion, feedback, Q&A, educational videos & films	Test + Homework
10	2h	Derivative applications	Chapter 2 / Speed & Its Relation to Differentiation	Lecture, discussion, feedback, Q&A, educational videos & films	Test + Homework
11	2h	Derivative applications	Chapter 2 / Straight Line Equation & Inflection Points	Lecture, discussion, feedback, Q&A, educational videos & films	Test + Homework
12	2h	Indefinite integration	Chapter 3 / Integration Rules	Lecture, discussion, feedback, Q&A, educational videos & films	Test + Homework
13	2h	Integration of trigonometric, exponential & logarithmic functions	Chapter 3 / Trigonometric, Exponential &	Lecture, discussion, feedback, Q&A, educational videos & films	Test + Homework

			Logarithmic Functions Rules		
14	2h	Integration applications	Chapter 3 / Integration Applications	Lecture, discussion, feedback, Q&A, educational videos & films, practical training	Test + Homework
15	2h	Integration applications: finding area	Chapter 3 / Finding Area	Lecture, discussion, feedback, Q&A, educational videos & films, practical training	Test + Homework

11. Course Evaluation

100points and a passing grade of 50.
The grade distribution is as follows:
30points for the monthly exam
5points for the tasks assigned to the student, such as daily preparation, daily oral exams, and participation
5points for the student's evaluation based on attendance, interaction, participation in extracurricular activities, and written exams
60points for the final theoretical exam

12. Teaching and Learning Resources

.1Applied Mathematics by Yaqoub Saba'a.
.2From the Schaum Series (Solving Electrical Circuits) by Joseph
.3Calculas (Thomas(
.4Place Transformation
.5Methods for Solving Differential Equations by Khaled Ahmed Al-Samarrai - Yahya Abdul Saeed

4-Mathematics

1.Course Name	Mathematics
2. Course Code	MTI100
3. Semester/Year	First/2025-2026
4. Description Preparation Date	15/7/2025
5. Available Attendance Forms	1- Weekly lesson schedule (theoretical) 2- Discussions, scientific seminars and other extracurricular activities
6. Credit Hours/ Number of Units	2*15 weeks=30 / 2 units (2 theoretical)
7. Course Instructor(s)	Dr. Zahra Mohammed Saeed Ismael

8. Course Objectives

General Objectives

Study of mathematical laws, equations and their applications.

Cognitive Objectives:

The student will be able to:

A1.Understand simple mathematical laws and equations .

A2. Apply laws in the field of electrical circuits.

Skill-Based Objectives:

B1. Accuracy in applying mathematical equations

B2. Aims to learn solutions to mathematical equations and perform measurements and applications in the field of electrical circuits.

Affective and Value-Based Objectives:

C1. Establishing accuracy, discipline, and mastery in work (instilling professional ethics

C2. Developing responsibility and reliability

C3. Promoting the spirit of teamwork and cooperation

Transferable Skills (Related to Employability and Personal Development):

D1. Analytical thinking and problem-solving skills

D2. Accuracy and attention to detail

D3. Occupational safety skills

9. Teaching and Learning Strategies

	((Theoretical lectures / listening lectures / conversation lectures / interactive lectures / searching in libraries and the Internet for specific topics)).

10. Course Structure

Week	Hours (Th)	Required Learning Outcomes	Unit/Chapter Name	Teaching Method	Assessment Method
1	Th2	Matrices and Their Properties	Chapter 1 / Matrices	Lecture, discussion, feedback, Q&A, educational videos.	Test + Homework
2	Th2	Determinants and their properties	Chapter 1/ Determinants	Lecture, discussion, feedback, Q&A, educational videos.	Test + Homework
3	Th2	Solving Linear Equations - Cramer's Method/Applications of Determinants.	Chapter 1/ Solving Linear Equations	Lecture, discussion, feedback, Q&A, educational videos.	Test + Homework
4	Th2	Using the substitution method to find the value of currents in a multi-source electrical circuit	Chapter 1/ The substitution method	Lecture, discussion, feedback, Q&A, educational videos.	Test + Homework
5	Th2	Vectors/Vector Analysis/Vector and Scalar Quantities/Vector .Algebra	Chapter 2 /Vectors	Lecture, discussion, feedback, Q&A, educational videos.	Test + Homework
6	Th2	Vector Arithmetic Operations in Space Phase and directional representation of alternating quantities, phase angle, and finding the resultant of vector quantities.	Chapter 2 / Vector Arithmetic Operations	Lecture, discussion, feedback, Q&A, educational videos.	Test + Homework

7	Th2	Orthogonal Vectors Unit/Vector Scale/Scalar and Vector Product	Chapter 2/ Vectors Unit	Lecture, discussion, feedback, Q&A, educational videos.	Test + Homework
8	Th2	Applications of Vectors / Magnetic Flux / Max Well	Chapter Two / Applications of Vectors	Lecture, discussion, feedback, Q&A, educational videos.	Test + Homework
9	Th2	Scalar Multiplication of Vectors Using Angle/Directional Multiplication of Vectors Using Coordinates	Chapter 2/ Scalar and Directional Multiplication of Vectors	Lecture, discussion, feedback, Q&A, educational videos.	Test + Homework
10	Th2	Trigonometric Functions and Trigonometric Relationships / Logarithmic Functions	Chapter 2 / Trigonometric Functions	Lecture, discussion, feedback, Q&A, educational videos.	Test + Homework
11	Th2	Calculating the DC current value of a half-bridge circuit/Calculating the effective voltage value/Load line of a transistor Chapter Two/Applications of functions	Chapter 2/ Applications of functions	Lecture, discussion, feedback, Q&A, educational videos.	Test + Homework
12	Th2	The Basic Function/Hyperbolic Functions.	Chapter 3/The Basic Function	Lecture, discussion, feedback, Q&A, educational videos.	Test + Homework
13	Th2	Applications of graphing exponential functions for a first-order electrical circuit, representing an R-C filter circuit with an exponential function,	Chapter 3 / Applications of graphing functions	Lecture, discussion, feedback, Q&A, educational videos.	Test + Homework
14	Th2	Limits / The goal of algebraic and trigonometric functions / Applications of limits.	Chapter 3 / Limits	Lecture, discussion, feedback, Q&A, educational videos.	Test + Homework

15	Th2	Applications to the limits of	Chapter 3 / Analysis of DC Circuits	Lecture, discussion, feedback, Q&A, educational videos.	Test + Homework

11. Course Evaluation

100 :points and a passing grade of 50.
The grade distribution is as follows:
30 :points for the monthly exam
5 :points for tasks assigned to the student, such as daily preparation, daily oral exams, and participation
5 :points for student evaluation based on attendance, interaction, participation in extracurricular activities, and written exams
60 :points for the final theoretical exam

12. Teaching and learning resources

- 1. Applied Mathematics by Yaqoub Saba'a.
- 2. From the Schaum Series (Solving Electrical Circuits) by Joseph
- 3. Calculas (Thomas)
- 4. Place Transformation
- 5. Methods for Solving Differential Equations by Khaled Ahmed Al-Samarrai - Yahya Abdul Saeed

Electronic Principles

1.Course Title	Electronic Principles
2.Course Code	ELT101
3.Semester/Year	Second / 2025–2026
4.Date of Description Preparation:	1/9/2025
5.Available Attendance Forms	□ Weekly lecture schedule (theoretical) □ Laboratory (practical)

	Discussions, scientific seminars, and other extracurricular activities
6.Credit Hours / Units	4 × 15 weeks = 60 hours / 4 units (2 theoretical + 2 practical)
7.Course Instructor(s)	Dawood salim
8.Course Objectives	

General Objectives:

1. Students will become familiar with semiconductor electronic components: types, structures, properties, uses in electronic circuits, and applications.
2. Analyze circuits containing these components, including optoelectronic devices and their applications.
3. Read and understand electronic circuit diagrams and schematics.
4. Recognize and identify different electronic devices.
5. Perform calculations for circuits that include electronic elements.
6. Apply mathematical principles and formulas to analyze electronic circuits.
7. Understand practical applications of electronic circuits.

Cognitive Objectives:

Students will be able to:

- Apply transistor usage in electronic circuits.
- Calculate voltages and currents in transistor circuits.

Practical Skills:

- Practical methods for testing transistors.
- Transistor biasing circuits and their characteristics.
- Using transistors as voltage regulators.
- Operation of phototransistors.

Affective Objectives:

- Develop interest and positivity toward electronics.
- Strengthen self-learning habits in new topics related to electronics.
- Appreciate the role of electronics in daily life, technology, and society.

- Build self-confidence in handling and designing circuits.

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Transferable & Employability Skills

1. **Problem-Solving and Critical Thinking:**
   - Analyze technical problems related to electronic circuits and provide logical solutions.
   - Apply systematic reasoning to explain circuit behavior.
2. **Teamwork:**
   - Work in groups during lab experiments and projects.
   - Share roles and responsibilities within a team.
3. **Communication:**
   - Express technical ideas clearly in presentations or discussions.
   - Write structured and professional technical reports.
4. **Digital & Technical Skills:**
   - Use circuit simulation/design software (Multisim, Proteus, Tinkercad).
   - Search and analyze reliable technical information online.
5. **Time Management:**
   - Complete assignments and reports on time.
   - Plan practical projects within set deadlines.
6. **Self-Learning & Continuous Development:**
   - Learn new concepts or software beyond the syllabus.
   - Evaluate and improve personal performance based on feedback.
7. **Critical Thinking:**
   - Evaluate lab results, distinguish correct from incorrect outcomes.
   - Question and analyze experimental circuit performance.
8. **Use of Tools & Equipment:**
   - Safe and effective use of oscilloscope, multimeter, and signal generator.
   - Handle sensitive electronic components professionally.

9.Teaching & Learning Strategies

- Theoretical lectures
- Listening & interactive discussions
- Guided conversations
- Research in libraries and online sources

10 .Course Structure (Weekly Breakdown)

Week	Hours	Learning Outcomes	Unit / Topic	Teaching Method	Assessment
1	2T + 2P	Atomic structure .Orbital Radiuse.Energy Level . Cristal . Energy Bands . Conduction in crystal. Hole Current. How Hole moves	Chapter 1: Semiconductor Theory	Lecture, discussion, Q&A, videos, lab practice	**Test + Homework**
2	2T + 2P	Doping . Negative Type (N) Semiconductor. Positive Type (P) Semiconductor . Electrons current . Hole current . Bulk resistance	Chapter 1: Semiconductor Theory	Lecture, discussion, Q&A, videos, lab practice	**Test + Homework**
3	2T + 2P	Semiconductor Diodes. (P N) Junctions .Unbiased Diode . Depletion layer . Barrier potential . Temperature effects . Energy hill . Forward bias . Reveres bias . Types currents in reverse bias . Breakdown voltage	Chapter 1: Junction Diode	Lecture, discussion, Q&A, videos, lab practice	**Test + Homework**
4	2T + 2P	Current Rectifier diode . Forward Curve of diode . Knee voltage . total resistance . Maximum forward current . Current limited resistor . Reverse curve diode . Diode Approximations (Ideal-second-third0 . Examples	Chapter 1: Junction Diode	Lecture, discussion, Q&A, videos, lab practice	**Test + Homework**
5	2T + 2P	Have-Wave Rectifier. Voltage values and their derivation . D.C current . Output frequency . solving application Examples	Ch.2: Diode circuits	Lecture, discussion, Q&A, videos, lab practice	**Test + Homework**
6	2T + 2P	Center tap Rectifier . Voltage values . D C Current . Output frequency . Examples . Comparison between halvewave and Center tap Rectifiers	Ch.2: Diode circuits	Lecture, discussion, Q&A, videos, lab practice	**Test + Homework**

7	2T + 2P	Bridge Rectifiers . Calculating the voltage and current values . Output frequency . Example	Ch.2: Diode circuits	Lecture, discussion, Q&A, videos, lab practice	**Test + Homework**
8	2T + 2P	Filters. Input Choke (L C)filter . Solving Application questions	Ch.3: Filters	Lecture, discussion, Q&A, videos, lab practice	**Test + Homework**
9	2T + 2P	Capacitive Filter (R C) . Solving Application questions.	Ch.4: Filters	Lecture, discussion, Q&A, videos, lab practice	**Test + Homework**
10	2T + 2P	Positive Clipper . Negative Clipper. Biased Clipper. Combination Cipper . Positive Clamper . Negative Clamper Voltage Doubl. Voltage Tripler . Voltage Quadrupler	Ch.4:	Lecture, discussion, Q&A, videos, lab practice	**Test + Homework**
11	2T + 2P	Zener Diode. Structure . Zener symbol .Zener Effect . avalanche breakdown and zener breakdown. Breakdown voltage Temperature coefficients	Ch.4: Zener diode	Lecture, discussion, Q&A, videos, lab practice	**Test + Homework**
12	2T + 2P	Zener Regulator . Maximum specific resistance . solving examples for zener regulation	Ch.4Zener regulator	Lecture, discussion, Q&A, videos, lab practice	**Test + Homework**
13	2T + 2P	Transistor installation . Transistor regions symbols . Relation off current . Alpha . Beta . relation between alpha and beta	Ch.4: Bipolar Transistors	Lecture, discussion, Q&A, videos, lab practice	**Test + Homework**
14	2T + 2P	Type off bias transistor . Transistor connection . Transistor equivalent circuits . Cat-off current and break down voltage .	Ch.5: Bipolar Transistors	Lecture, discussion, Q&A, videos, lab practice	**Test + Homework**
15	2T + 2P	Transistor curves / Collector curves . Base curves . Currant gene curve	Ch.5: Bipolar Transistors	Lecture, discussion, Q&A, videos, lab practice	**Test + Homework**

11 . Assessment & Grading

Total: 100 marks (Pass mark = 50)

- 20 marks: Monthly exam
- 10 marks: Assignments (daily preparation, oral tests, participation)
- 10 marks: Attendance, interaction, extracurricular activities
- 10 marks: Practical lab performance (results, reports, attendance)
- 10 marks: Final practical exam
- 40 marks: Final theoretical exam

12. Learning Resources

Textbooks

English:

- *Electronic Principles* (8th Ed.) – Malvino
- *Electronic Devices* (9th Ed.) – Floyd

Arabic (translated/compiled):

- *Principles of Electronics* (Translation of Malvino), Badr Mohammed Ali Al-Wattar & Dr. Riyadh Kamal, 1985
- *Electronics in Electrical Applications* – Dr. Samira Rustum, 1978

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2 .YouTube Channels:

- هندسة إلكترونيات (Electronics Engineering)
- ابن تسلا (Son of Tesla)
- عاشور مغربي (Ashour Maghrebi)

English Language

Syllabus	week
tenses (present ,past future) / wh. Questions	1st
parts of speech. /words with more than one meaning	2nd
: present tenses (simple, continuous) . / have ,have got	3th
describing countries . / collocation	4th
past tenses	5th
: irregular verbs / making connections / nouns , verbs and adjectives…..etc. making negatives	6th
quantity / articles	7th
buying things	8th
verb patterns / future intentions	9 th
hot verbs	10 th
what's it like / comparative and superlative adjectives	11 th
talking about cities / money /synonyms antonyms	12 th
present perfect and past simple /for and tense /tense revision	13 th
past participles / bands and music / adverbs / word pairs	14 th
have (got) to /should /must	15 th

Hor./week			1st year	DC Electrical ciurcuts
sum	TH.	Pra.		
4	2	2		
				English Language

Theoretical Syllabus

Syllabus	Week
E.Eectrical circuit Units . multiples and -1 submultiple ,Definitions(voltage-current-resistance – conductance- Ohm, s Law, factors affected on resistance , resisti Temperature affected on resistance , examples	1st
A-Series resistance connetion , voltage divider law , examples B-Parallel resistance connection , current divider la Series – Parallel connections , Star - Delta	2nd
Applications on series , parallel , compouned , star , delta connections	3th
A-kirchofff,s Laws (KcL,KVL) , EXAMPLES B-Maxwell(Mesh)method , examples	4th
Thevenin ,s theorem , examples	5th
Norton, stheorem, example	6th
A-Maximum transfer power theorem , examples B-Superposition theorem , examples	7th
Alternating current and voltage , sinwaveequation, rms, average value frequency, form factor, peak factor, phase difference, waves form, exameles	8th
Vector quantities , vector addition and subtraction , vector resultant phase angle, summing AC voltage and currents examples	9 th
AC affect on purley , resistance , inductance and capacitance , examples	10 th
, AC affected 0n series c ircuit (RL,RC,RLC cireuit) total impedance total current , power factor , phase angle , vector diagram , examples	11 th
, AC affected 0n series c circuit (RL,RC,RLC) branche current , total current phase , angle , vecter Diagram ,examples Diagram	12 th

Complex numbers AC analusis (impedance, voltage, corrent) , in rectangular form , polar and vice , versa examples	**13 th**
Series resonance circuit , resonance characteristics , Band width , Q- factor , examples	**14 th**
Parallel resonance circuits , resonance characteristics ,examples	**15 th**

1. Electrical Technology (Edward Hughes)
2. Basic Circuits(A-M-F Brooks) pergaman press
3.Introduction to Electric circuits (M Romanwitz) John Willy
4. Basic Electrical Engineering (Fitzgerald & Rlgginborthan)Mc-Graw-Hill

Practical Syllabus

Syllabus	week
Training on working in laboratory Reports Writing Instruments uses	**1st**
Resistance color calculation Measuring Resistance by ohmmeter	**2nd**
How to used ac and de voltmeter &ammeter to measure Voltages and currents	**3th**
Measurement of emf and battery internal resist study the temperature coefficient	**4th**
Conductors resistive verification of ohm, s Law	**5th**
Series , parallel and compound resistance connections (exam)	**6th**
Star to delta equivalent transform at delta to star equivalent transformation (examples)	**7th**
Verification of KCL and KVL L	**8th**
Verification thvenin, s theorem Verification Norton theorem	**9 th**
Verification superposition theorem	**10 th**
	11 th
Verification max power transfer theorem	**12 th**
Oscilloscope , coparasion between RMSand Average calculation of form factor and peak factor (examples)	**13 th**
Series (RL), Series (AC) for ac circ parallel (RL) , parallel (RC) for ac circuits	**14 th**

Phase- angle measurement – series (RLC) ac circuits (examples)	**15 th**

Hor/week			**1st year**	**AC Circuts Analysis**
Sum	**Th.**	**Pra.**		
4	**2**	**2**		

Theoretical Syllabus

Syllabus	Week
Apply thevenin and Norton theorem on AC circuits , examples Apply max- power transfer and superposition theorem, examples	**1st**
Power calculations in AC circuits , examples	**2nd**
Apparent power , draw power – triangle , power factor correction ,exam	**3th**
Maximum power transfer theorem on AC circuit	**4th**
Practical methods for measuring resistance of high and small val	**5th**
Three- Phase circuit , generation , star and delt 3- Phase characteristic , 3- Phase balance loads , exam	**6th**
3- Phase unbalance loads (star – delta), examples	**7th**
Power measurement method 3- phase load by using one wattmeter , two wattmeter , three wattmeter , examples	**8th**
Electro – magnetic , magnetic field, flux , mmf, magnetic circuit	**9 th**
Solved example on magnetic circuits	**10 th**
Self- induction , mutual – inductance , coil connection , examples	**11 th**
DC affected on RL circuit , current growth and equations , time constant , examples	**12 th**
DC affected on RL circuit , charging and discharging voltage equation , time constant , examples	**13 th**
Electrical measurement , instrument classification moving coil Advantage and disadvantage of permanent magnet and moving iron inst , range extention, examples	**14 th**

Wattmeter instrument , oscilloscope instrument	**15 th**

1. Electrical Technology (Edward Hughes)
2. Basic Circuits(A-M-F Brooks) pergaman press
3.Introduction to Electric circuits (M Romanwitz) John Willy
4. Basic Electrical Engineering (Fitzgerald & Rlgginborthan)Mc-Graw-Hill

Practical Syllabus

Syllabus	Week
Verification thevenin,s theorem in AC circuits \ Verification Norton's s theorem in AC circuits	**1st**
Corporation between analog and digital voltmeter to measure the AC and DC voltages (examples)	**2nd**
Verification max. power transfer theorem in AC circuits	**3th**
Power measurement by using three – voltmeters and three – ammeters (examples)	**4th**
Power measurement by using wattmeter \ Power factor measurement (examples)	**5th**
Power factor improvement (examples)	**6th**
Voltage and current in three – phase Star connection circuits \ Voltage and current in three – phase Delta connection	**7th**
Resistance measurement by using bridge whetstone	**8th**
Loaded and Unloaded Voltage Divide	**9 th**
Resistance measurement by using voltmeter and ammeter methods	**10 th**
High Resistance (insulators) measurement by using magnifier	**11 th**
Ammeter extend \ Ammeter calibration with another	**12 th**
Voltmeter extend \ Voltmeter calibration	**13 th**
Study Time – constant for DC (RL) \ Study Time – constant for DC (RL) circuits	**14 th**

English Language

Theoretical Syllabus	Week
tenses (present ,past future) / wh. Questions	1st
parts of speech. /words with more than one meaning	2nd
: present tenses (simple, continuous) . / have ,have got	3th
describing countries . / collocation	4th
past tenses	5th
: irregular verbs / making connections / nouns , verbs and adjectives…..etc. making negatives	6th
quantity / articles	7th
buying things	8th
verb patterns / future intentions	9 th
hot verbs	10 th
what's it like / comparative and superlative adjectives	11 th
talking about cities / money /synonyms antonyms	12 th
present perfect and past simple /for and tense /tense revision	13 th
past participles / bands and music / adverbs / word pairs	14 th
have (got) to /should /must	15 th

Power Eletronics

Hor./week			2nd year	Power Eletronics1
sum	P.	TH.		
5	3	2		

Theoretical syllabus

week	Theoretical syllabus
1st	Power electronic,electronic components which used in high power control(power diodes, thyristor and power transistors) pevison of single phase rectifier circuits by using diodes).

2nd	Three phase rectifier circuits by suing diodes, output voltage , waveform, diode current waveform, output voltage equation in case of resistance load.
3th	Using the transistor as switch, regions of operation, transistor as a switch (cut off and saturation)
4th	Power transistor in (off) and (on) state, improvement of (off) and (0n) time by suing speed up capacitance, practical problems.
5th	Unipolar junction transistor, construction, theoretical operation, using the transistor as relaxation oscillator practical example.
6th	Operational amplifier, description of operational amplifier (OP-AMP) as sperate components. Zero crossing detector, comparator.
7th	The use of OP-AMP as astable multivibrator and monostable multivibrator, photo conduction cells, photo diodes.
8th	Light –Emitting diodes (LED), photo transistor, the use of optical comparator in power Electronic circuits.
9 th	Thyristor, construction, characteristic, curves for a thyristor, thyristor conduction in forward biasing, thyristor family, thyristor representation as a double transistor circuit.
10 th	Thyristor conduction methods, conduction throw the gate, minimum gate current causing conduction, conduction time, conduction due to high forward voltage rectifier (dv/dt)
11 th	DIAC, TRIAC characteristics, practical applications, thyristor triggering methods, triggering on DC and AC, current pulse triggering types.
12 th	Thyristor triggering circuits, DC and AC triggering circuits.
13 th	Pulse current triggering circuits, relaxation oscillator, zero crossing detector, comparator with a stable and monostable multivibrators (OP-AMP and timers)
14 th	Thyristor general application introductory, AC to DC inverter DC to AC invertor, DC to DC inverter, AC to AC inverter, phase controlled halfwave rectifier with resistive and inductive load. Output current and voltage waveform, output voltage equations.
15 th	Half controlled fullwave rectifier fully controlled, resistive and inductive load. Generated waveforms, output voltage equations for free wheeling diode.

المفردات العملية الكترونيات القدرة1:

week	Practical syllabus
1st	Power electronic lab, be familiar with various electronic instrument and equipment.
2nd	Single phase rectifier with resistance load , induvive load with and without free wheeling diode.
3th	Bridge rectifier with and without filter and zener diode.

4th	Three phase rectifier with center tap transformer.
5th	Using the transistor as a switch, measuring the minimum value of base current switch changing the transistor to saturation state, measuring of cut off and saturation time , using speed up capacitor to improve the ON time.
6th	Using Unipolar junction transistor as relaxation oscillator to investigate timing and synchronizing.
7th	Inverting and noninverting operational amplifier.
8th	Operational amplifier applications in power eclectronic field, astable multivibrator, zero crossing detector.
9 th	Using operational amplifier as comparator with sine wave and saw tooth wave.
10 th	Examination
11 th	Thyristor characteristic , gate charcteristic measurement (triggering minimum current and voltage)
12 th	Conduction and triggering angles measurement by suing triggering Dc source.
13 th	Mosfet characteristics, measurement current and voltage.
14 th	Half controlled single phase rectifier with resistance and inductance load by using speed wheel diode.
15 th	Half controlled full wave rectifier with resistance and inductance load.

وزارة التعليم العالي والبحث العلمي

الجامعة التقنية الشمالية

التخصصات التكنولوجية

قسم التقنيات الكهربائية فرع / القوى

أسم المادة : الكترونيات القدرة2 Power Eletronics2	المرحلة الثانية	الساعات الاسبوعية		
		ن	ع	م
	الكورس الثاني	2	3	5
لغة التدريس : انكليزية	أسم الكتاب المنهجي			

المفردات النظرية الكترونيات القدرة2

week	Theoretical syllabus

1st	Regenerating fully controlled inverters, examples, DC motor speed control.
2nd	Three phase inverters, output voltage waveform with , triggering pulses and equations.
3th	Thyristor protection from the high rate sdof change in current and voltage, protection from transient change in source voltage, fully protection circuit from all possible due to current and voltage.
4th	DC to AC inverter methods of forcing the thyristor to get off.
5th	Parallel and series inverter , single and three phase , control methods in charging frequency and voltage , output waveforms.
6th	Inverter applications , emergency power supply , single phase DC moter speed control.
7th	Three phase motor control by using a constant ratio of variation frequency and voltage.
8th	Choppers DC to DC inverter frequency constant line constant.
9 th	Types of choppers , DC motor speed cntrol.
10 th	AC to AC inverter, single phase voltage regulator, three phase voltage regulator.
11 th	General applications on single and three phase induction motor speed control due to the change in stator voltage, using the closed loop feedback circuit to control the slippery rings of AC motor.
12 th	Cyclic inverter, AC to DC cyclic inverter, DC to AC cyclic inverter.
13 th	AC to AC cyclic inverter control block diagram.
14 th	Using amplitude modulation for speed control.
15 th	Using bipolar transistor for AC motor speed contro.

Practical syllabus

week	Practical syllabus
1st	Fully controlled full wave rectifier with resistance and inductance load.
2nd	DC motor speed controlled due to chage in armuture voltage.
3th	Triggering circui for AC and DC current by suing resistance and capacitance.
4th	Half ontrolled three phase full wave rectifier with inductance load, (resistnce + inductance).
5th	Full controlled three phase full wave retifier with inductance load (R+L).
6th	Examination
7th	Diac Triac characteristics.
8th	Single phase parallel and series DC to AC inverter (inverter).
9 th	Single phase induction motor speed control due to the change in frequency.

10 th	**Inverter for DC to DC (chopper)**
11 th	**Single phase inverter from AC to AC (voltage regulater).**
12 th	**Induction motor speed control due to the change in stator voltage.**
13 th	**Study of width pulse modulation circuit by using operational amplifier as comparators.**
14 th	**Slipper rings induction motor speed controlled by suing section of rotary element circuit.**
15 th	**Single phase inverter from DC to AC using power transistor.**