Al-Furat Al-Awsat Technical University

جامعة الفرات الاوسط التقنية

First Cycle – Bachelor's Degree (B.Sc.) - Electrical Engineering Techniques

بكالوريوس - تقنيات الهندسة كهربائية

Table of Contents

1. Overview

This catalogue is about the courses (modules) given by the program of Electrical Engineering techniques to gain the Bachelor of science in electrical engineering techniques degree. The program delivers (48) Modules with (6000) total student workload hours and 240 total ECTS. The module delivery is based on the Bologna Process.

نظره عامه

يتناول هذا الدليل المواد الدراسية التي يقدمها برنامج تقنيات الهندسة الكهربائية للحصول على درجة بكالوريوس علوم تقنيات الهندسة الكهربائية. يقدم البرنامج (48) مادة دراسية، مع (6000) إجمالي ساعات حمل الطالب و 240 إجمالي وحدات أوروبية. يعتمد تقديم المواد الدراسية على عملية بولونيا.

2. Undergraduate Courses 2023-2024

Module 1

Code	Course/Module Title	ECTS	Semester
ATU23011	DC Electrical Circuits	6	1
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
3	2	78	72
Description			
This course explains how to analyze circuits that have direct current (DC) or voltage sources. This course introduces the fundamental concepts of electrical direct current (DC) circuits and the most common practice problems students face during studying. To make learning easier tips and tricks have been shared in each topic. It will help students to understand the techniques used in DC circuits in the simplest manner. Students of this course will learn how to solve electrical circuit problems with DC sources using different techniques such as KVL, KCL, Nodal Mesh Analysis. These techniques are the basics of any electrical circuit problem or electronic circuit problem.			

Module 2

Code	Course/Module Title	ECTS	Semester
ATU23012	Digital Technologies	6	1
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
3	2	6	72
Description			
This Course provides an Overview of Number Systems and Logic Gates in Digital Circuits. It give a general overview of the design of Logic Gates starting from the problem to truth table and after this obtaining a function relies to the combination of inputs. It provides for students the opportunity to design a circuit based on Gates. This course is basic to understand digital system. This Course includes following topics with Simple Animated Video Explanation. • Introduction to number system & terms related to it. (Terms - Bit, Byte. Nibble) • Convert the Number from the given Number System to the specified Number System. (Number systems - Decimal , Binary, Octal , Hexadecimal an their Conversions from one Number System to another (Integer and Fractional).) • Perform the given Binary Arithmetic Operation on the given Data. (Binary Arithmetic - Compliments - 1's and 2's, Addition, Subtraction, Multiplication and Division (up to 8 bit).			

Module 3

Code	Course/Module Title	ECTS	Semester
ATU23013	Engineering Drawing	5	1
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
0	4	63	62
Description			
This Introduction to engineering drawings and blueprints course is aimed at those who have little or no previous experience of working with engineering drawings			

and who are required to read, understand and interpret them as part of their role. Working with engineering drawings involves understanding and analyzing, making decisions, and processing data. The Introduction to engineering drawings and blueprints based on practical application of print interpretation. It will give you a better understanding of the view representation, dimensions, tolerances, and symbols used on prints.

Module 4

Code	Course/Module Title	ECTS	Semester
ATU23014	Differential Mathematics	5	1
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	2	63	62
Description			
Topics selected from financial mathematics, matrix algebra, linear inequalities and linear programming, counting arguments, and statistics and probability. Recommendations: High school geometry and algebra. (Math 30 is not a prerequisite.) Engineering students are not permitted to take MATH 14 for credit. History of mathematics in Babylonian, Egyptian, Greek, and other ancient civilizations. Number systems and computational techniques; achievements in elementary algebra, geometry, and number theory; famous results, proofs and constructions. Emphasis on solving problems in the style and spirit of each culture. Engineering students are not permitted to take MATH 15 for credit. A mathematical treatment of the symmetries of wallpaper patterns. The main goal is to prove that the symmetries of these patterns fall into seventeen distinct types. In addition, students will learn to identify the symmetries of given patterns (with special emphasis on the periodic drawings of M.C. Escher) and to draw such patterns. Three lectures, one section. Recommendations: High school geometry. Engineering students are not permitted to take MATH 16 for credit. Introduction to mathematical methods for dealing with questions arising from social decision making. Topics vary but usually include ranking, determining the strength of, and choosing participants in multicandidate and two-candidate elections, and apportioning votes and rewards to candidates. Recommendations: High school algebra. Engineering students are not permitted to take MATH 19 for credit.			

Module 5

Code	Course/Module Title	ECTS	Semester
ATU23015	Engineering Workshops	5	1
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
0	4	63	62
Description			
Students enrolled in the Problem Solving & Decision Making Skills course will receive comprehensive training that combines theoretical concepts with practical examples, interactive exercises, and real-world scenarios. The course is designed to develop critical thinking, analytical skills, and effective decision-making abilities relevant to both academic and professional contexts. Students will engage with case studies and problem-solving exercises to practice applying structured techniques to challenges they may encounter in projects, research, or future workplaces. Along with a detailed course manual, supplementary materials such as worksheets, process guides, and sample solutions will be provided to reinforce learning. By the end of the course, students will be able to analyze problems critically, generate solutions, and make informed decisions confidently.			

Module 6

Code	Course/Module Title	ECTS	Semester
ATU23016	English Language (Beginner)	3	1
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	1	48	27
Description			
This subject provides undergraduate students with a solid foundation in the English language, focusing on developing basic skills in reading, writing, listening, and speaking. Students learn essential grammar, vocabulary, and sentence structures to communicate effectively in academic and everyday contexts. Emphasis is placed on simple writing tasks, comprehension exercises, and conversational practice to build confidence and fluency. The course also introduces basic technical and			

academic terminology relevant to engineering studies, helping students understand simple technical texts and instructions. Through interactive exercises, group activities, and guided practice, students develop the ability to comprehend and produce English sentences accurately. By the end of the course, students will be able to communicate confidently in classroom and professional settings.

Module 7

Code	Course/Module Title	ECTS	Semester
ATU23021	Engineering Mechanics	6	2
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
3	2	78	72
Description			
This subject introduces students to the principles of static equilibrium and the application of Newton's laws of motion in solving engineering problems. Emphasis is placed on developing analytical skills, drawing accurate free body diagrams, and applying self-checking strategies to ensure correct solutions. Key topics include the study of forces, two-dimensional equilibrium of particles and rigid bodies, center of gravity and centroids, distributed loading, hydrostatics, friction, and analysis of truss structures. The course also covers shear force and bending moment diagrams for beams under various loading conditions. Through theoretical instruction and practical problem-solving exercises, students gain the ability to analyze and design mechanical and structural systems, preparing them for advanced courses in mechanics and engineering design.			

Module 8

Code	Course/Module Title	ECTS	Semester
ATU23022	Human Rights and Democracy	6	2
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	2	48	102

Description
Definition and historical development of human rights and democracy; concepts of democracy, freedom and equality, different democratic perceptions, democratic culture, democracy in school and family, democratic citizenship; rights and freedoms, children and women's rights, national and international regulations on human rights (Universal Declaration of Human Rights, European Convention on Human Rights, Convention on the Rights of the Child, etc.); basic problems in the field of human rights, human rights and democracy education

Module 9

Code	Course/Module Title	ECTS	Semester
ATU23023	Arabic Language	5	2
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	1	77	125

Description

This course addresses the four language skills of Speaking, Listening, Reading and Writing in an integrated fashion, with a focus on Speaking.

I- Language Functions:

greet others using several regional greetings and culture-specific expressions
provide information about your nationality, occupation and place of stay
talk about your family status and family members
describe your plans and habitual actions in your daily life
describe your state of being and how you feel
ask for things you need
invite people ove introduce someone else, such as a friend, colleague, or family member
engage in dialogue (Q&A) with others around the above listed topics

II- Grammar Points:

basic word structure and sentence structure
dependent and independent pronoun patterns (dpp and ipp)
verb conjugations in the present future tense
singular and plural forms of nouns and adjectives

masculine and feminine nouns and adjectives descriptive pattern function words (want, have, have been) adverbs of time and days of the week
numbers and rules of counting
negations

III- Arabic Script:
introduction to the rules of Arabic writing
reading and writing of the 28 Arabic letters in isolated and connected forms at a Beg level

Module 10

Code	Course/Module Title	ECTS	Semester
ATU23024	AC Electrical Circuits	5	2
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
3	2	47	125
Description			
This subject provides students with a solid understanding of alternating current (AC) circuits, their behavior, and practical applications in electrical engineering. Topics include sinusoidal sources, phasor representation, impedance, resonance, power factor, and the analysis of series, parallel, and RLC circuits. Students learn to apply fundamental laws and analysis techniques, including Kirchhoff's laws, mesh and nodal analysis, and complex number methods, to solve AC circuit problems. The course also covers voltage, current, and power relationships in single-phase and three-phase systems. Laboratory sessions and simulations offer hands-on experience in measuring, analyzing, and interpreting AC circuit performance. By the end of the subject, students will be able to design, analyze, and troubleshoot AC circuits confidently.			

Module 11

Code	Course/Module Title	ECTS	Semester
ATU23025	Integral Mathematics	5	2

Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	2	62	125
Description			
This subject provides electrical engineering students with a focused study of integral calculus and its direct applications in engineering systems. Topics include definite and indefinite integrals, techniques of integration, and their use in calculating areas, volumes, and physical quantities such as charge, energy, and work. Emphasis is placed on modeling and analyzing electrical circuits, control systems, and signal processing problems using integral calculus. The course is structured to build from fundamental concepts to more advanced applications, reinforced through quizzes and problem-solving exercises on key subtopics. Laboratory and computational sessions offer practical experience in applying both analytical and numerical integration methods. By the end of the subject, students will possess the mathematical skills necessary to analyze, design, and solve complex engineering problems effectively in electrical engineering contexts.			

Module 12

Code	Course/Module Title	ECTS	Semester
ATU23026	Computer Principles	3	2
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	2	12	75
Description			
This subject introduces students to the fundamental concepts of computer systems and their applications in engineering and technology. Topics include computer organization, digital logic, central processing unit (CPU) operation, memory hierarchy, input/output systems, and data representation. Students gain an understanding of hardware and software interactions, basic programming concepts, and the role of operating systems in managing computing resources. Emphasis is placed on how computers process, store, and communicate information, and on using computational tools to solve practical problems. Laboratory sessions provide hands-on experience in programming, system simulation, and data handling. By the end of the subject, students will be able to utilize computer systems effectively in engineering analysis, design, and general technological applications.			

Module 13

Code	Course/Module Title	ECTS	Semester
ATU23031	DC Generators	6	3
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
3	2	63	87
Description			
This subject provides a comprehensive study of DC generators, focusing on their theoretical principles, construction, and operational characteristics. Students explore different types of DC generators, including series, shunt, and compound configurations, and examine the fundamental processes of electromotive force (EMF) generation, magnetic flux distribution, armature reaction, and commutation. The course emphasizes the analysis of performance parameters such as voltage regulation, efficiency, load characteristics, and operational limits. Laboratory sessions and simulation exercises allow students to apply theoretical knowledge, evaluate generator performance under varying conditions, and understand practical considerations in design and operation. By the end of the subject, students will be able to critically analyze, design, and implement DC generator systems for power generation and industrial applications, establishing a solid foundation for advanced studies in electrical machines and power engineering.			

Module 14

Code	Course/Module Title	ECTS	Semester
ATU23032	Electronic Essentials	6	3
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
3	2	78	72
Description			
is a core course offered to students pursuing a bachelor's degree in Electrical Engineering Techniques. It introduces the student to the fundamental principles and practical aspects of electronic circuits and devices. The course covers essential			

components such as resistors, capacitors, diodes, transistors, and operational amplifiers, emphasizing their operation, characteristics, and applications in analog and digital systems. Throughout the course, the student learns basic circuit analysis, biasing, amplification, and logic gate operations. Laboratory sessions complement the lectures by allowing students to design, build, and test electronic circuits using standard measurement tools and simulation software. By the end of the course, the student will be able to analyze and construct simple electronic systems, understand the function of key components, and apply theoretical knowledge to practical engineering problems. This course forms the basis for advanced studies in power electronics, control, and communication systems.

Module 15

Code	Course/Module Title	ECTS	Semester
ATU23033	Electrical Circuit Analysis	5	3
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
3	2	87	47
Description			
is a fundamental course offered to students enrolled in the Bachelor's degree in Electrical Engineering Techniques. It introduces the student to the essential concepts and analytical methods used to understand and evaluate electrical circuits. The course covers topics such as Ohm's and Kirchhoff's laws, mesh and nodal analysis, Thevenin's and Norton's theorems, superposition, source transformation, and transient and steady-state analysis of AC and DC circuits. Through lectures, problem-solving sessions, and laboratory experiments, the student develops skills in circuit modeling, analysis, and verification using both manual calculation and computer-based simulation tools. By the end of the course, the student will be able to analyze complex electrical networks, determine current, voltage, and power relationships, and apply theoretical principles to practical engineering problems. This course provides the analytical foundation for advanced subjects such as electronics, power systems, and control engineering.			

Module 16

Code	Course/Module Title	ECTS	Semester
ATU23034	Sensors	5	3
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
3	2	48	77
Description			
It introduces the student to the principles, operation, and applications of sensors and transducers used in modern engineering systems. The course covers various types of sensors, including temperature, pressure, displacement, flow, light, and proximity sensors, along with their electrical characteristics and signal conditioning requirements. Students will learn how sensors convert physical quantities into measurable electrical signals and how these signals are processed and interfaced with control and monitoring systems. Laboratory sessions provide hands-on experience in testing, calibrating, and integrating sensors with microcontrollers and data acquisition systems. By the end of the course, the student will be able to understand the working principles of different sensors, select appropriate sensors for specific applications, and design basic measurement systems used in industrial and automation environments.			

Module 17

Code	Course/Module Title	ECTS	Semester
ATU23035	Applied Mathematics	5	3
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
3	2	63	62
Description			
It provides the student with essential mathematical tools and techniques required for solving engineering problems. The course covers topics such as differential equations, complex numbers, Laplace transforms, Fourier series, matrix algebra,			

and vector analysis, emphasizing their applications in electrical and electronic systems. Students learn to apply mathematical models to analyze and design engineering systems, interpret results, and optimize performance. Problem-solving sessions and practical examples help the student connect mathematical theory with real-world engineering applications, such as circuit analysis, control systems, and signal processing. By the end of the course, the student will be able to formulate and solve engineering-related mathematical problems, use analytical methods effectively, and apply mathematical reasoning in technical decision-making. This course builds a strong foundation for advanced studies in control, electronics, and power engineering.

Module 18

Code	Course/Module Title	ECTS	Semester
ATU23036	Computer Applications	3	3
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	1	63	12
Description			
It introduces the student to fundamental computer concepts, software tools, and programming techniques used in engineering analysis and design. The course covers topics such as computer hardware and operating systems, word processing, spreadsheets, presentation tools, and basic programming using software such as MATLAB or Python. Students will learn how to apply computational tools for data analysis, circuit simulation, report generation, and problem-solving in engineering contexts. Practical sessions emphasize hands-on experience with software applications commonly used in electrical engineering laboratories and technical documentation. By the end of the course, the student will be able to effectively use computer applications to analyze data, prepare technical reports, perform engineering calculations, and support decision-making. This course builds the foundation for advanced computer-based design and simulation subjects in the engineering curriculum.			

Module 19

Code	Course/Module Title	ECTS	Semester
ATU23041	DC Motors	6	4
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
3	2	78	72
Description			
This course introduces students to the principles, construction, operation, and applications of Direct Current (DC) motors. It covers the fundamental concepts of electromagnetism, torque generation, and energy conversion from electrical to mechanical form. Students will study the main components of DC motors, including the stator, rotor (armature), brushes, and commutator, and understand their roles in motor performance. The course explores various types of DC motors, such as series, shunt, compound, and brushless designs, highlighting their characteristics, advantages, and limitations. Practical aspects such as speed control, torque management, and efficiency optimization are emphasized, with examples from industrial and commercial applications. Laboratory sessions provide hands-on experience in testing, analyzing, and troubleshooting DC motors. By the end of the course, students will have the knowledge to select, operate, and maintain DC motors effectively in engineering systems.			

Module 20

Code	Course/Module Title	ECTS	Semester
ATU23042	Electronic Circuits	6	4
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
3	2	78	72
Description			
This subject introduces students to the principles, analysis, and design of electronic circuits used in modern electrical engineering applications. Topics include semiconductor devices such as diodes, transistors, and operational amplifiers, and			

their roles in amplifiers, switches, and signal processing circuits. Students explore both theoretical and practical aspects of analog and basic digital circuits, including circuit laws, network theorems, and analysis techniques. Emphasis is placed on understanding circuit behavior, designing reliable systems, and troubleshooting faults. Laboratory sessions provide hands-on experience in constructing, testing, and analyzing circuits to reinforce theoretical knowledge. By the end of the subject, students will be able to design, simulate, and implement essential electronic circuits, preparing them for more advanced courses and practical engineering applications.

Module 21

Code	Course/Module Title	ECTS	Semester
ATU23043	Advanced Electrical Circuits Analysis	5	4
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
3	2	78	47
Description			
Understanding and analyzing complex electrical circuits is essential for modern engineering applications. This subject equips students with advanced skills in DC and AC network analysis, transient and steady-state responses, resonance, and three-phase circuits. Techniques such as mesh and nodal analysis, superposition, and network theorems are applied to both linear and nonlinear circuits. Students also learn to use Laplace and Fourier transforms for solving circuit problems and modeling system behavior. Laboratory and simulation exercises provide hands-on experience in testing, analyzing, and validating circuit performance. By the end of the subject, students will be able to design, analyze, and optimize sophisticated electrical circuits, preparing them for professional practice, advanced courses, and research in power systems, electronics, and control engineering.			

Module 22

Code	Course/Module Title	ECTS	Semester
ATU23044	Instruments and Measurements	5	4
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
3	2	78	47
Description			
Electrical and electronic measurement techniques are fundamental for accurate engineering analysis and design. This subject introduces students to the principles, operation, and characteristics of measuring instruments such as analog and digital voltmeters, ammeters, multimeters, oscilloscopes, and signal generators. Students learn to measure electrical quantities precisely, analyze errors, and apply calibration methods to ensure reliable results. Emphasis is placed on both theoretical concepts, including measurement standards, uncertainty, and accuracy, and practical skills through laboratory experiments. By the end of the subject, students will be able to select, operate, and interpret various instruments effectively, troubleshoot measurement systems, and perform precise electrical measurements. This knowledge equips them for advanced studies and professional practice in electrical engineering, instrumentation, and control systems.			

Module 23

Code	Course/Module Title	ECTS	Semester
ATU23045	Engineering Analysis	5	4
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
3	2	78	47
Description			
Mathematical and analytical techniques are essential for solving complex engineering problems. This subject equips students with the skills to apply methods such as linear algebra, differential equations, numerical methods, and vector analysis to practical applications in electrical circuits, control systems, and			

signal processing. Students learn to model systems, analyze behavior, and interpret results using both analytical and computational tools. Emphasis is placed on problem-solving, critical thinking, and linking theory to real-world applications. Laboratory and computer-based exercises provide hands-on experience in applying these techniques to engineering challenges. By the end of the subject, students will be able to formulate, analyze, and solve engineering problems effectively, preparing them for advanced courses, research, and professional practice in electrical engineering.

Module 24

Code	Course/Module Title	ECTS	Semester
ATU23046	English Language (Intermediate)	3	4
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	1	48	27
Description			
This subject focuses on developing English language skills specifically for engineering students. It emphasizes reading, writing, listening, and speaking in technical and academic contexts relevant to electrical engineering. Students learn to understand and interpret technical manuals, engineering reports, and scholarly articles, while building specialized vocabulary related to circuits, instrumentation, control systems, and electronics. Writing exercises focus on clear documentation, lab reports, project proposals, and technical emails. Listening and speaking activities include presentations, discussions, and explaining engineering concepts accurately. The course integrates practical exercises and interactive tasks to enhance fluency and professional communication. By the end of the subject, students will be able to comprehend technical English materials, communicate engineering ideas effectively, and confidently participate in academic and professional engineering environments.			

Module 25

Code	Course/Module Title	ECTS	Semester
ATU23051	Principles of Power Engineering	5	5
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
3	2	78	47
Description			
This subject provides students with a solid foundation in electrical power systems, covering the generation, transmission, and distribution of electrical energy. Key topics include the operation of generators, transformers, transmission lines, and distribution networks, along with basic power system analysis, load characteristics, efficiency, and safety considerations. Students also explore the integration of renewable energy sources and their impact on modern power systems. Emphasis is placed on applying theoretical knowledge through laboratory experiments and computer-based simulations to analyze and solve practical engineering problems. By the end of the subject, students will be able to understand, evaluate, and troubleshoot basic power engineering systems, preparing them for advanced courses, industrial applications, and professional practice in electrical power and energy engineering.			

Module 26

Code	Course/Module Title	ECTS	Semester
ATU23052	DC Power Conversions	5	5
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
3	2	78	47
Description			
Efficient conversion of DC electrical energy is crucial in modern engineering applications. This subject introduces students to the principles, analysis, and applications of DC-DC power conversion systems. Topics include converter			

topologies such as buck, boost, buck-boost, and multi-stage converters, along with their operating modes, voltage and current relationships, and efficiency considerations. Students learn about steady-state and dynamic performance, control techniques, and protection mechanisms used in DC power systems. Emphasis is placed on practical design, simulation, and laboratory experiments to develop hands-on skills in constructing and testing DC converters. By the end of the subject, students will be able to analyze, design, and implement efficient DC power conversion systems for applications in renewable energy, electric vehicles, industrial power supplies, and advanced power electronics.

Module 27

Code	Course/Module Title	ECTS	Semester
ATU23053	Electrical Transformers and Induction Machines	5	5
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
3	2	78	47
Description			
This course provides fundamental knowledge and practical insights into electrical transformers and induction machines, essential components in modern electrical engineering systems. Students will explore the construction, operation, and applications of single-phase and three-phase transformers, including equivalent circuits, efficiency, voltage regulation, and testing methods. The course also covers the principles and performance characteristics of induction motors—both squirrel cage and wound rotor types—focusing on torque-speed characteristics, starting methods, and efficiency. Emphasis is placed on real-world applications in power distribution and industrial systems. Laboratory sessions complement theoretical concepts with hands-on experience in testing and analyzing transformer and motor performance. By the end of the course, students will gain the technical skills to operate, maintain, and troubleshoot these machines effectively, preparing them for roles in power engineering, industrial automation, and electrical maintenance. This course forms a crucial foundation for advanced studies in electrical machines and energy systems.			

Module 28

Code	Course/Module Title	ECTS	Semester
ATU23054	Electromagnetic Fields	5	5
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
3	2	78	47
Description			
This course introduces the fundamental principles of electromagnetic fields, forming a theoretical foundation for various electrical engineering applications. Students will study vector calculus, electric and magnetic field theory, and the laws governing them, including Coulomb's Law, Gauss's Law, Biot–Savart Law, and Ampère's Law. Emphasis is placed on understanding electric potential, capacitance, magnetic flux, inductance, and Maxwell's Equations in both static and dynamic conditions. The course also explores wave propagation in different media and the behavior of electromagnetic fields in practical electrical systems. Through analytical problem-solving and illustrative examples, students develop a strong grasp of field interactions critical to the design and analysis of electrical devices such as motors, transformers, transmission lines, and antennas. By the end of the course, students will be equipped with the mathematical and physical understanding required for more advanced studies in electromagnetics, electrical machines, and communication systems, as well as practical engineering applications.			

Module 29

Code	Course/Module Title	ECTS	Semester
ATU23055	Microprocessor	5	5
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
3	2	78	47
Description			
This course provides a comprehensive introduction to microprocessors and their			

role in modern electronic and control systems. It focuses on the architecture, operation, and programming of microprocessor-based systems, with an emphasis on the widely used 8085 and 8086 microprocessors. Students will learn instruction sets, addressing modes, and assembly language programming, along with interfacing techniques for memory and peripheral devices. The course also covers interrupt handling, timing diagrams, and basic system design concepts. Practical lab sessions reinforce theoretical knowledge through hands-on experience in writing and debugging assembly programs and interfacing microprocessors with input/output devices. By the end of the course, students will be able to design, program, and troubleshoot microprocessor-based systems, preparing them for applications in embedded systems, automation, instrumentation, and control. This subject forms a vital part of the curriculum for understanding digital system design and lays the groundwork for more advanced studies in microcontrollers and embedded technologies.

Module 30

Code	Course/Module Title	ECTS	Semester
ATU23056	Numerical Analysis	5	5
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
3	2	78	47
Description			
This course introduces the fundamental concepts and methods of numerical analysis, essential for solving complex mathematical problems encountered in electrical engineering. Students will learn techniques for root finding, interpolation, numerical differentiation and integration, and the solution of linear and nonlinear systems of equations. The course also covers numerical methods for solving ordinary differential equations, with applications relevant to circuit analysis, control systems, and signal processing. Emphasis is placed on algorithm development, error analysis, and the implementation of numerical methods using computational tools such as MATLAB or Python. Through practical exercises and problem-solving sessions, students will develop the skills to model, simulate, and analyze engineering problems that cannot be solved analytically. By the end of the course, students will be equipped to apply numerical techniques in real-world electrical engineering tasks, supporting informed decision-making and efficient system design. This course is foundational for advanced study and professional practice in engineering analysis.			

Module 31

Code	Course/Module Title	ECTS	Semester
ATU23061	Advanced Power Engineering	5	6
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
3	2	78	47
Description			
This subject provides students with an in-depth understanding of modern power systems and their components. Topics include advanced concepts in power generation, transmission, and distribution, power system stability, fault analysis, protection systems, and the integration of renewable energy sources. Students learn to analyze complex electrical networks, evaluate system performance, and apply methods for improving efficiency, reliability, and safety. Emphasis is placed on both theoretical knowledge and practical applications through simulations, case studies, and laboratory exercises. By the end of the subject, students will be able to design, analyze, and optimize advanced power systems, assess system performance under various operating conditions, and apply solutions to real-world engineering challenges in industrial and utility-scale power networks, preparing them for professional practice and advanced studies in electrical power engineering.			

Module 32

Code	Course/Module Title	ECTS	Semester
ATU23062	AC Power Conversions	5	6
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
3	2	78	47
Description			
This course introduces students to the principles, analysis, and practical			

applications of AC power conversion systems used in modern electrical engineering. It focuses on the conversion of AC power between different voltage, frequency, and phase configurations using transformers, converters, and inverters. Topics include single-phase and three-phase systems, power factor correction, AC voltage regulation, harmonic reduction, and efficiency improvement techniques. Students will study the operation of various AC-AC converters such as cycloconverters and matrix converters, as well as their applications in motor drives and renewable energy systems. The course emphasizes both theoretical understanding and hands-on experience through laboratory experiments and simulation exercises. By the end of the course, students will be able to design, analyze, and troubleshoot AC conversion circuits and systems, preparing them to work effectively in industrial automation, power electronics, and energy conversion sectors within the electrical engineering field.

Module 33

Code	Course/Module Title	ECTS	Semester
ATU23063	Synchronous and Special Machines	6	6
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
4	2	93	57
Description			
This course provides a comprehensive study of synchronous machines and special electrical machines widely used in industrial and power applications. It covers the construction, operating principles, performance characteristics, and control methods of synchronous generators and motors, including excitation systems, synchronization, and voltage regulation. In addition, the course introduces special machines such as stepper motors, brushless DC motors, reluctance motors, and linear motors, emphasizing their design, operation, and industrial applications. Students will learn analytical and experimental techniques for evaluating machine performance and efficiency. Practical laboratory sessions and simulation exercises reinforce theoretical knowledge, focusing on real-world scenarios such as power generation, automation, and control systems. By the end of the course, students will be able to analyze, test, and maintain synchronous and special machines effectively, gaining the technical competence required for careers in electrical power systems, industrial automation, and advanced electromechanical system design.			

Module 34

Code	Course/Module Title	ECTS	Semester
ATU23064	Digital Controllers	6	6
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
4	2	93	57
Description			
This course introduces the principles, design, and implementation of digital control systems used in modern electrical and industrial applications. It covers the fundamentals of discrete-time systems, sampling theory, z-transform techniques, and digital controller design methods such as PID, lead-lag, and state-space approaches. Students will study the differences between analog and digital control, the role of microcontrollers and digital signal processors (DSPs), and the impact of quantization and computational delays on system performance. Emphasis is placed on practical implementation using simulation tools and hardware-based experiments. Applications in motor drives, power electronics, and process control systems are explored to connect theory with real-world practice. By the end of the course, students will be able to design, analyze, and program digital controllers for various engineering systems, preparing them for careers in automation, embedded systems, and advanced control engineering within the electrical and industrial sectors.			

Module 35

Code	Course/Module Title	ECTS	Semester
ATU23065	English Language (Advanced)	3	6
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	2	48	27
Description			
This course is designed to enhance students' advanced English language skills with			

a focus on academic and professional communication in the field of electrical engineering. It emphasizes advanced reading, writing, listening, and speaking abilities necessary for technical studies and workplace communication. Students will engage with engineering-related texts, research papers, and technical reports to develop vocabulary and comprehension skills relevant to their discipline. The course also covers report and proposal writing, oral presentations, and technical correspondence to improve clarity and precision in professional contexts. Interactive discussions and project-based activities help students build confidence in presenting technical ideas and collaborating in multidisciplinary environments. By the end of the course, students will be able to effectively interpret technical materials, produce coherent academic writing, and communicate complex engineering concepts in English, preparing them for both higher education pursuits and professional roles in the global engineering community.

Module 36

Code	Course/Module Title	ECTS	Semester
ATU23066	**Elective 1**	5	6
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	2	63	62
Description			
This course allows students to explore specialized topics within the field of electrical engineering based on their interests and career goals. It provides flexibility for in-depth study of emerging technologies or advanced applications such as renewable energy systems, power electronics, automation, smart grids, or industrial control systems. The elective course encourages independent learning, critical thinking, and practical problem-solving through project work, research assignments, and case studies. Students will apply fundamental engineering principles to analyze and design solutions for real-world electrical engineering challenges. Depending on the chosen topic, the course may include laboratory experiments, simulations, or industry-related applications to strengthen technical and analytical skills. By the end of the course, students will gain specialized knowledge and hands-on experience in a selected area of electrical engineering, preparing them for professional practice, innovation, and further study in their chosen field of specialization.			

Module 37

Code	Course/Module Title	ECTS	Semester
ATU23071	Transmission and Distribution Systems	5	7
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
3	2	78	47
Description			
This course provides an in-depth study of electrical power transmission and distribution systems, focusing on the efficient and reliable delivery of electrical energy from generation stations to end users. It covers the fundamental principles of high-voltage transmission, distribution network design, and system operation under various load conditions. Topics include transmission line parameters, voltage regulation, power losses, system protection, grounding, and fault analysis. Students will also explore modern advancements such as underground cables, smart grids, and renewable energy integration into existing networks. Practical aspects of system planning, substation design, and load management are emphasized through analytical exercises and simulation-based studies. By the end of the course, students will be able to analyze, design, and evaluate transmission and distribution networks, ensuring safety, efficiency, and sustainability in power delivery systems—preparing them for careers in power utilities, infrastructure development, and energy management sectors.			

Module 38

Code	Course/Module Title	ECTS	Semester
ATU23072	Electric Machine Drives	5	7
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
3	2	78	47
Description			
This course provides a comprehensive study of electric machine drives and their applications in modern industrial and energy systems. It focuses on the principles,			

control, and performance of various electric drives, including DC, induction, and synchronous motor drives. Students will learn about power electronic converters, speed and torque control methods, braking techniques, and dynamic modeling of drive systems. The course emphasizes the integration of machines with power electronics and digital controllers for efficient motion and process control. Laboratory experiments and simulation exercises allow students to analyze real-world drive performance, parameter tuning, and system optimization. Applications in electric vehicles, robotics, and renewable energy systems are also explored. By the end of the course, students will be able to design, implement, and troubleshoot electric drive systems, gaining essential knowledge and practical skills for careers in automation, industrial control, and power conversion engineering.

Module 39

Code	Course/Module Title	ECTS	Semester
ATU23073	Power Systems Analysis	5	7
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
3	2	78	47
Description			
This course provides students with the analytical tools and techniques necessary to understand and evaluate the performance of electrical power systems. It focuses on modeling, analysis, and operation of generation, transmission, and distribution components within interconnected networks. Key topics include per-unit system representation, load flow analysis, fault analysis, symmetrical components, and system stability studies. Students will learn how to assess voltage profiles, power losses, and reliability under normal and faulted conditions using manual calculations and computer-based simulations. Emphasis is placed on problem-solving, system optimization, and interpretation of analytical results for practical engineering applications. The course integrates theory with laboratory exercises and software-based analysis to enhance understanding of real-world power system behavior. By the end of the course, students will be able to model, analyze, and evaluate complex power networks, preparing them for professional work in power system operation, planning, and design.			

Module 40

Code	Course/Module Title	ECTS	Semester
ATU23074	Electric Power Generation Stations	5	7
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
3	2	78	47
Description			
This course provides a detailed study of electric power generation stations, covering the principles, design, and operation of conventional and renewable energy-based plants. Students will examine various generation technologies, including thermal, hydro, nuclear, solar, and wind power systems, with a focus on their electrical, mechanical, and environmental aspects. Key topics include generator operation, plant control systems, efficiency optimization, load management, and grid integration. The course also addresses safety standards, economic considerations, and environmental impacts associated with power generation. Laboratory experiments, simulation exercises, and case studies are incorporated to reinforce theoretical concepts and provide practical insights into real-world plant operations. By the end of the course, students will be able to analyze, design, and evaluate power generation systems, understand their operational challenges, and propose effective solutions. This knowledge prepares graduates for careers in power utilities, renewable energy projects, and industrial power system management.			

Module 41

Code	Course/Module Title	ECTS	Semester
ATU23075	Control Systems Analysis	5	7
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
4	2	93	3232
Description			

This course introduces students to the principles, modeling, and analysis of control systems used in electrical engineering and industrial applications. It covers both classical and modern control theories, including transfer functions, block diagram representation, feedback principles, and system stability. Students will study time-domain and frequency-domain analysis methods, root locus, Bode and Nyquist techniques, and the design of controllers such as PID and lead-lag compensators. The course emphasizes the use of simulation tools to model dynamic systems, analyze responses, and evaluate performance under various operating conditions. Practical laboratory exercises and case studies enhance understanding of real-world applications in automation, robotics, and power electronics. By the end of the course, students will be able to model, analyze, and design control systems to achieve desired performance and stability. The course equips graduates with essential analytical and problem-solving skills for careers in industrial control, automation, and advanced engineering systems.

Module 42

Code	Course/Module Title	ECTS	Semester
ATU23076	Project 1	5	7
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
0	5	93	
Description			
Project 1 is a practical, research-oriented course designed to integrate and apply the knowledge and skills acquired throughout the Electrical Engineering Techniques program. Students undertake an individual or small-group project focused on a real-world engineering problem or system relevant to electrical engineering, such as power systems, control systems, automation, or renewable energy applications. The course emphasizes project planning, literature review, problem definition, design, implementation, and testing. Students are guided in applying analytical tools, simulation software, and laboratory techniques to develop functional solutions. Regular progress presentations and reports cultivate technical communication, teamwork, and project management skills. By the end of the course, students will produce a comprehensive project report and presentation demonstrating their ability to identify engineering challenges, propose innovative solutions, and implement them effectively. Project 1 prepares students for professional engineering practice, advanced research, and subsequent			

capstone projects, bridging theoretical knowledge with practical, hands-on experience.

Module 43

Code	Course/Module Title	ECTS	Semester
ATU23081	Professional Ethics	3	8
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	1	48	27
Description			
This course introduces students to the principles of professional ethics and their application within the field of electrical engineering. It emphasizes the importance of ethical decision-making, responsibility, and integrity in professional practice. Topics include engineering codes of conduct, safety and environmental considerations, intellectual property, social responsibility, and ethical challenges in technology and innovation. Students will examine case studies highlighting real-world ethical dilemmas in engineering projects, power systems, automation, and industrial applications. The course also explores legal and regulatory frameworks that govern engineering practice, as well as the role of professional organizations in upholding ethical standards. Through discussions, assignments, and scenario analyses, students develop critical thinking skills, ethical reasoning, and professional judgment. By the end of the course, graduates will be equipped to navigate complex ethical situations, prioritize public safety and welfare, and uphold the highest standards of professionalism in their engineering careers.			

Module 44

Code	Course/Module Title	ECTS	Semester
ATU23082	Power System Protection	6	8
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
4	2	93	57

Description
This course provides an in-depth study of the principles, devices, and strategies used to protect electrical power systems from faults and abnormal operating conditions. It covers the fundamentals of protective relays, circuit breakers, fuses, and other protective equipment, as well as the coordination and selection of protective devices for transmission, distribution, and industrial networks. Students will learn about fault analysis, overcurrent, differential, distance, and pilot protection schemes, and the design of protection systems to ensure system stability, reliability, and safety. The course emphasizes both theoretical analysis and practical application through simulation exercises and laboratory experiments, allowing students to evaluate protection schemes under different fault conditions. By the end of the course, students will be able to analyze power system faults, select and coordinate protective devices, and design effective protection strategies. This knowledge prepares graduates for careers in power utilities, industrial electrical systems, and power system operation and maintenance.

Module 45

Code	Course/Module Title	ECTS	Semester
ATU23083	Stability of Power Systems	6	8
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
4	2	93	57
Description			
This course provides a detailed study of the stability aspects of electrical power systems, focusing on the ability of a system to maintain synchronism under normal and disturbed operating conditions. It covers the fundamentals of rotor dynamics, small-signal (linear) stability, transient stability, and voltage stability, emphasizing the analysis of generator and network responses to disturbances such as faults, load changes, and switching events. Students will learn modeling techniques for synchronous machines, excitation systems, and power system components, along with simulation methods to predict system behavior. Practical case studies and computer-based exercises enable students to analyze stability margins, evaluate control strategies, and design stabilizing measures. By the end of the course, students will be able to assess the stability of power networks, apply corrective and preventive measures, and optimize system performance. This knowledge equips graduates for careers in power system operation, planning, and research, ensuring			

reliable and secure electricity supply.

Module 46

Code	Course/Module Title	ECTS	Semester
ATU23084	High Voltage Techniques	5	8
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
3		78	47
Description			
This course introduces students to the principles, design, and applications of high-voltage engineering in electrical power systems. It covers the generation, measurement, and testing of high voltages, as well as the behavior of electrical equipment and insulation under high-voltage conditions. Topics include dielectric materials, breakdown mechanisms in gases, liquids, and solids, overvoltage phenomena, and insulation coordination. Students will study high-voltage testing techniques for transformers, cables, circuit breakers, and surge arresters, along with safety procedures and standards. Emphasis is placed on both theoretical understanding and practical experience through laboratory experiments and simulation exercises. By the end of the course, students will be able to analyze high-voltage systems, assess insulation performance, design overvoltage protection schemes, and conduct high-voltage tests safely and effectively. This knowledge prepares graduates for careers in power utilities, industrial systems, research laboratories, and the design and maintenance of high-voltage electrical equipment.			

Module 47

Code	Course/Module Title	ECTS	Semester
ATU23085	Project 2	5	8
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
0	6	93	32

Description
Project 2 is an advanced, capstone course designed to integrate and apply the comprehensive knowledge and skills acquired throughout the Electrical Engineering Techniques program. Building on Project 1, students undertake an individual or group project that addresses a complex, real-world engineering problem within areas such as power systems, control, automation, renewable energy, or industrial electrical applications. The course emphasizes all stages of the engineering design process, including problem identification, literature review, system design, implementation, testing, and evaluation. Students are encouraged to employ analytical methods, simulation tools, and laboratory experiments to develop effective solutions. Regular progress presentations, technical reporting, and peer review cultivate professional communication, project management, and teamwork skills. By the end of the course, students will deliver a complete project report and presentation demonstrating their ability to apply engineering principles, innovate solutions, and handle practical challenges. Project 2 prepares graduates for professional practice, advanced research, and industry-ready competence.

Module 48

Code	Course/Module Title	ECTS	Semester
ATU23086	**Elective 2** Modeling and Simulation Modern Control Systems Sustainable Energy Industrial Management	5	8
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
3	2	78	47
Description			
Elective 2 offers students the opportunity to specialize in a selected area of electrical engineering according to their interests and career objectives. Available options include Modeling and Simulation, Modern Control Systems, Sustainable Energy, and Industrial Management. In Modeling and Simulation, students learn to represent electrical systems mathematically and analyze performance using software tools. Modern Control Systems focuses on advanced control strategies,			

digital controllers, and system optimization for industrial applications. Sustainable Energy covers renewable energy technologies, energy efficiency, and integration of clean energy into power networks. Industrial Management emphasizes project planning, resource management, quality control, and leadership skills within engineering environments. The course integrates theoretical knowledge with practical applications through case studies, simulations, and project work. By the end of the course, students will gain specialized technical expertise and applied problem-solving skills in their chosen area, preparing them for professional practice, advanced study, or research in modern electrical engineering fields.

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