Tikrit University
جامعة تكريت

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

بكالوريوس ـ هندسة كهربائية

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1. Overview

This catalogue is about the courses (modules) given by the program of Electrical Engineering to gain the Bachelor of Science 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.

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نظره عامه

يتناول هذا الدليل المواد الدراسية التي يقدمها برنامج الهندسة الكهربائية للحصول على درجة بكالوريوس العلوم. يقدم البرنامج (48) مادة دراسية مع (٦٠٠٠) إجمالي ساعات حمل الطالب و ٢٤٠ إجمالي وحدات أوروبية. يعتمد تقديم المواد الدراسية على عملية بولونيا.

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2. Undergraduate Courses 2023-2024

Module 1

Code	Course/Module Title	ECTS	Semester
ELEC-111	Fundamentals of DC Electrical Circuits	8	1
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
3	1/2/1	102	98
Description			
This module introduces students to the fundamentals of D.C. electrical circuits, its syntax, and its use in solving D.C. electrical networks. The module covers the basic concept of electrical circuits and units, Ohm's law , series circuits, parallel circuits, series-parallel circuits, methods of analysis dc circuits (branch-current method, mesh method, nodal method, bridge-networks, and stat-delta conversions) , network theorems dc circuits (superposition theorem, Thevenin theorem, Norton theorem, maximum power transfer theorem, Millman's theorem, and substitution theorem), capacitors in D.C. circuits, inductors in D.C. circuits, and sinusoidal alternating waveforms.			

Module 2

Code	Course/Module Title	ECTS	Semester
MAT-101	Calculus I	5	1
Class (hr/w)	**Lect**/Lab./Prac./**Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
3	1/1	73	52

Description

This course aims to establish fundamental knowledge of This subject covers Transcendental functions as Inverse Trigonometric Functions, Derivatives of the Inverse Trigonometric Functions, Natural Logarithm and its Derivative, and its properties, Exponential Function, logarithmic functions with its Derivative and integral. The module covers the basic concept of techniques of integration as integration good deal parts, Tabular method, Trigonometric substitution with several forms, integration a rational functions by partial fractions which involved four cases, distinct linear factors, repeated linear factors, irreducible quadratic factors and repeated irreducible quadratic factors. so the module provides a knowledge about Hyperbolic Function as: Relationships between trigonometric and hyperbolic functions, connections with Algebra, derivatives and Integrals of Hyperbolic Function, Inverse of Hyperbolic Function. It also gives students information's about a topics: Power Series, Taylor Polynomials, Taylor's Series for Sine, Cosine and e^x.

Module 3

Code	Course/Module Title	ECTS	Semester
ELEC-105	**Electronics Physics**	6	1
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
3	1/1	73	77

Description

The Solid-State Physics Module offers dedicated features for the analysis of III-V semiconductor device basic operation at the fundamental physics level for modern microelectronics. The following topics are covered in this module: charge carrier statistics and carrier transport mechanism, electron-hole electrical properties, and a variety of common electronic/optoelectronic device types, including PN-Junction, Schottky diodes, Light-Emitting Diodes (LEDs), their structure and characteristics, Laser diodes, and more. This course also covers clean-room classes and contemporary semiconductor integrated circuits processing and high-speed optical system technologies. These provide students with great opportunities to develop a strong foundation in electronic/optoelectronic devices and integration technology and link this knowledge with upcoming courses in the ensuing study years.

Module 4

Code	Course/Module Title	ECTS	Semester
ENG-104	Computer Science	4	1
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	2	60	40

Description

This course offers students a comprehensive exploration of the fundamental concepts and principles that underpin the field of computer science. By delving into various subjects including the historical development of computing, data representation, computer components, algorithms, programming languages, operating systems, applications, internet and networking, and Cybersecurity, students will develop a well-rounded understanding of the discipline. By examining the evolution of computer science over time, students will acquire a broad perspective on the field and its significance in contemporary society. Through a combination of theoretical knowledge and practical

applications, this module equips students with the necessary foundation to pursue further studies or careers in computer science.

Module 5

Code	Course/Module Title	ECTS	Semester
ENG-106	Workshop Skills	5	1
Class (hr/w)	**Lect/<u>Lab</u>./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/sem)**
2	3	73	52
Description			
The engineering workshop course focuses on identifying risks in the work environment and industrial safety guidelines. And training on how to measure and determine, and the use of filing tools and their work. Learn about the types of wood used in carpentry, the process of shaping it, and the use of carpentry tools and machines. Training in welding work, its types, and the process of joining metals by welding. Training on various casting works and training on mechanical operation, which includes turning, milling, and grinding. Training on pipe knowledge, how to connect, sanitary engineering works, and training on the basics of electrical workshops.			

Module 6

Code	Course/Module Title	ECTS	Semester
ENG-108	English Language	2	1
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2		30	20
Description			
This course is designed to provide engineering students with the necessary oral and written skills required for effective communication in academic and workplace contexts, both with experts in their field and lay persons. It begins by introducing them to the principles of good academic practice, which are also presented as a model for ethical workplace practice, and thus help them to avoid issues such as plagiarism. The main part then leads on to developing research and summarizing skills that form the basis for the later activities. Students next learn to apply these skills to conducting technical presentations, as well as in group discussions that culminate in project planning activities.			

Module 7

Code	Course/Module Title	ECTS	Semester
ELEC-121	Fundamentals of AC Electrical Circuits	8	2
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
3	1/2/1	102	98
Description			

This module introduces students to the fundamentals of A.C. electrical circuits, its syntax, and its use in solving A.C. electrical networks. The module covers the basic elements and phasors, Ohm's law , series circuits, parallel circuits, series-parallel circuits, methods of analysis ac circuits (branch-current method, mesh method, nodal method, bridge-networks, and stat-delta conversions) , network theorems ac circuits (superposition theorem, Thevenin theorem, Norton theorem, maximum power transfer theorem, Millman's theorem, and substitution theorem) , complex power, series resonant circuit, parallel resonant circuit, series magnetic circuits, series-parallel magnetic circuits, and hysteresis and eddy losses.

Module 8

Code	Course/Module Title	ECTS	Semester
MATH-102	Calculus II	5	2
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
3	1/1	73	52
Description			

This course aims to establish fundamental knowledge of This subject covers Vectors involved Vector in Space, Dot and Cross Products, Equations for Lines and Planes in Space . The module covers the basic concept of the function of two and more variables and their derivatives as : partial derivatives , Chain Rules, Partial Derivatives with Constants Variables , Gradient and Directional Derivatives , Tangent Plane and normal lines, Applications of Partial of Derivative (maximum, minimum and saddle point). So the module provides a knowledge about Multiple Integral as: Double integral ,Double integral in polar coordinates , changing Cartesian integrals into Polar integrals, Triple integral (Rectangular, Cylindrical and Spherical) . It also gives students information's about a topics: -Addition, Subtraction, Multiplication and Division, polar representation of complex number and its roots.

Module 9

Code	Course/Module Title	ECTS	Semester
ENG-102	Engineering Mechanics	4	2
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	2	59	41
Description			

The course covers the following topics; statics of particles: forces in plane, forces in space, equilibrium, moment of a force, moment of a couple, equivalent systems of forces on rigid bodies, equilibrium in two dimensions, equilibrium in three dimensions, distributed forces: centroids and center of gravity, analysis of structures: trusses, frames and machines, internal forces in beams and cables, friction, moments of inertia of areas, moments of inertia of masses.

Module 10

Code	Course/Module Title	ECTS	Semester
ELEC-122	Digital Techniques	5	2
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	2/1	74	51
Description			

Understand different types of number systems and their conversions. Foundation in design and analysis of the operation of digital gates. Concepts of Boolean algebra, Karnaugh maps, combinational Logic Using NAND and NOR Gates, and Pulse Waveform Operation.

Module 11

Code	Course/Module Title	ECTS	Semester
ENG-105	Computer Programming I	4	2
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	2	60	40
Description			

This module introduces students to the Python programming language, its syntax, and its use in solving programming problems. The module covers the basic programming concepts of condition statements and iteration statements, along with the design and implementation of functions. The module also covers the basic data structures of Python, including lists, tuples, dictionaries, and sets. The module concludes with an introduction to string manipulation and regular expressions in Python.

Module 12

Code	Course/Module Title	ECTS	Semester
ENG-101	Engineering Drawing	4	2
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
	3	45	55
Description			

An engineering drawing course focuses on usage of drawing instruments, lettering, construction of geometric shapes, etc. Students study use of dimensioning, shapes and angles or views of such drawings. Dimensions feature prominently, with focus on interpretation, importance and accurate reflection of dimensions in engineering drawing. Other areas of study in this course may include projected views and development of surfaces.

Module 13

Code	Course/Module Title	ECTS	Semester
MATH-201	Engineering Analysis	5	3
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
3	1/1	73	52
Description			

The course is a requirement for the electrical engineering students. It introduces the principles of engineering Analysis subjects are required in electrical engineering. It enables students to study use these topics with the other electrical engineering courses.
Topics covered are: Fourier Transform, difference equations, Z transform, Bessel function, correlation, Error and Q function

Module14

Code	Course/Module Title	ECTS	Semester
ELEC-215	Electrical Networks	7	3
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
4	2	87	88
Description			

Electrical networks are an interconnection of electrical components (e.g., batteries, resistors, inductors, capacitors, switches, transistors) or a model of such an interconnection, consisting of electrical elements (e.g., voltage sources, current sources, resistances, inductances, capacitances). An electrical circuit is a network consisting of a closed loop, giving a return path for the current. Linear electrical networks, a special type consisting only of sources (voltage or current), linear lumped elements (resistors, capacitors, inductors), and linear distributed elements (transmission lines), have the property that signals are linearly superimposable. They are thus more easily analyzed, using powerful frequency domain methods such as Laplace transforms, to determine DC response, AC response, and transient response. In This course will be concentrate on the basic theories of three-phase system, analyzing the circuits by differential equations and algebraic equation represented by Laplace transformation.

Module 15

Code	Course/Module Title	ECTS	Semester
ELEC-217	Electromagnetic Field 1	5	3
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	1/1	59	66
Description			

The course is a requirement for the electrical engineering students. It introduce the physical nature of the electric fields, its sources, in addition to Gauss's law for determine the electric flux density for different types of charge distributions, and the divergences theory, up to Maxwell's first equation. It also discusses the concept of electric potential, potential difference, and the potential of the electric dipole. it discusses the current, current density and continuity.
also explain the properties of conductor, insulator and semiconductor materials, with field behavior through them, and boundary conditions up to capacitors and capacitance definition.

Module 16

Code	Course/Module Title	ECTS	Semester
ELEC-214	**Electronics I**	**5**	**3**
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	2/1	74	51
Description			

This course aims to establish fundamental knowledge of introduction to diode, rectification, clipping, clamping, Zener Diode. Presentation of the Bipolar Transistor Circuits (BJT): Construction, operation, configurations and characteristics, operating regions, load lines, the transistor as an amplifier, dc biasing circuits and stability, power dissipation, switching transistors, the BJT inverter. BJT Small-Signal Analysis: Transistor equivalent circuits, voltage and current gain, input and output impedance, low and high frequency operation.

Module 17

Code	Course/Module Title	ECTS	Semester
ELEC-213	Computer Programming II	4	3
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	2	60	40
Description			

This course is given students the basics and general form of the program, the sum of the introduction of variables and their directing in the program, graphics, types of graphics, prescriptions, philanthropists, modeling, simulation, solving mathematical equations, and applications of the Matlab program in the field of electricity engineering.

Module 18

Code	Course/Module Title	ECTS	Semester
ELEC-212	Logic Circuits	4	3
Class (hr/w)	**Lect/<u>Lab.</u>/Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	2	75	75
Description			
Design and implementation of combinational and sequential logic circuits. Concepts of Boolean algebra, Karnaugh maps, flip-flops, registers, and counters along with various logic families and comparison of their behavior and characteristics.			

Module 19

Code	Course/Module Title	ECTS	Semester
ELEC-221	Engineering Mathematics	5	4
Class (hr/w)	**<u>Lect</u>/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
3	1	59	66
Description			
The course is a requirement for the electrical engineering students. It introduces the principles of engineering Analysis subjects are required in electrical engineering. It enables students to study use these topics with the other electrical engineering courses. Topics covered are: Fourier Transform, difference equations, Z transform, Bessel function, correlation, Error and Q function			

Module 20

Code	Course/Module Title	ECTS	Semester
ELEC-226	Machines DC2	8	4
Class (hr/w)	**Lect/<u>Lab.</u>/Prac./<u>Tutor</u>**	**SSWL (hr/sem)**	**USWL (hr/w)**
4	2/2	116	84
Description			
This course aims to introduce the student to establish fundamental knowledge of the main technologies for the DC Machines generators, Motors and transformers of electrical power with an emphasis on their operating principles, their stability when interconnected and techniques for their control. Learn the construction of dc machine, and enhance the students' skills for the principles of commutation and armature reaction. Then they learn various types of dc machines including characteristics			

Module 21

Code	Course/Module Title	ECTS	Semester
ELEC-227	Electromagnetic Field 2	5	4
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	1/1	59	66
Description			
The course is a requirement for the electrical engineering students. It introduces the principle and physical nature of the magnetic fields, its sources, and the magnetic flux density for different types of current distributions, also explains: the inductance, torque , force acts on the current element through a magnetic field, time varying fields , induced voltage, curl and Stoke's theorem, up to Maxwell's equations for time varying fields. It also explains the electromagnetic wave propagation principles and the propagation media properties.			

Module 22

Code	Course/Module Title	ECTS	Semester
ELEC-224	Electronics 2	5	4
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	2/1	74	51
Description			
This course aims to establish fundamental knowledge of Field Effect Transistors (FET). FET: Junction field-effect transistor (JFET): physical operation and static characteristics. - Metal - Oxide semiconductor FET (MOSFET): depletion -type MOSFET, enhancement - type MOFET. DC analysis of FET, the FET as an amplifier, graphical (load line) analysis, small-single FET models, analysis of CS, CD and CG configurations, using FETs as switch, voltage variable resistor, and constant current source. Multistage Amplifiers: Analysis of multistage amplifiers (voltage gain, current gain. etc.). Types of multistage amplifiers (cascade ... etc.). RC-Coupled BJT Amplifier, Direct- Coupled BJT Amplifiers, Frequency Response, Multistage FET Amplifiers, Transformer Coupling. Introduction to four-layer Description and operation of silicon-controlled rectifier, DIAC, GTO and TRIAC.			

Module 23

Code	Course/Module Title	ECTS	Semester
ELEC-225	Electrical Measurement	5	4
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	1/1	59	66
Description			
This course aims to establish fundamental knowledge of Measurement design and engineering			

principal Measurement strategy. The module covers the Measurement, system of units, Measuring errors, classification of errors, analysis of errors, distribution of errors, DC-instruments, current instrument, voltage instrument, resistor instrument, series ohmmeter, parallel ohmmeter, AC-instrument, H.W. rectifier instrument, F.W. rectifier instrument, Electro dynamometer, wattmeter, Bridges measurements, DC-bridges, classification of bridge circuit, bridges accessories, AC-bridges, inductance bridges, mutual inductance bridges, and capacitance bridges.

Module 24

Code	Course/Module Title	ECTS	Semester
ELEC-112	**Democracy and Human Rights**ديموقراطية وحقوق الانسان	2	4
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/sem)**
2		30	20
Description			

حقوق الانسان: هي حقوق يتمتع بها جميع مكونات البشر لمجرد اننا من ابناء البشر, وهذه الحقوق متأصلة في جميع البشر مهما كان عرقهم او جنسهم او قوميتهم او مذهبهم ولاتمنح من أي دولة، وتتضمن حقوق الانسان والطفل في الحضارات القديمة والاسلام، المواثيق الدولية ، مصادر وضمانات حقوق الانسان ، القوانين والدساتير، مجلس حقوق الانسان، العولمة، التقدم التكنولوجي واثره على حقوق الانسان.

الديمقراطية: يرجع مصطلح الديمقراطية الى الحضارة اليونانية القديمة وهي عبارة عن مصطلح مكون من مقطعين هما: (Cratia) التي تعني حكم و (Demo))   التي تعني الشعب ليصبح المفهوم حكم الشعب ، وتتضمن الديمقراطية التطرق الى مفهومها ومعرفة الجذور التاريخية لها ، المكونات ، الخصائص ، المميزات ، الضمانات ، علاقة الديمقراطية ب (الدستور ، مؤسسات المجتمع المدني ، حقوق الانسان ، الحكم الرشيد، الانتخابات) ، الديمقراطية المعاصرة

Module 25

Code	Course/Module Title	ECTS	Semester
ELEC-316	Analog Communications	5	5
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	2/1	74	51
Description			

This course aims to establish fundamental knowledge of introduction and Construction of three phase induction motor. Presentation of the cage and wound rotor types, principles of operation and then find the equivalent circuit of three phase induction motor. Torque/speed characteristics are discussed. Starting torque, running torque and maximum torque, speed control, rating and application, testing and efficiency are also introduced.

Module 26

Code	Course/Module Title	ECTS	Semester
ELEC-313	MACHINES AC 1	6	5
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	1/2/1	88	62
Description			
This course aims to establish fundamental knowledge of introduction and Construction of three phase induction motor. Presentation of the cage and wound rotor types , principles of operation and then find the equivalent circuit of three phase induction motor. Torque/speed characteristics are discussed. Starting torque, running torque and maximum torque, speed control, rating and application , testing and efficiency are also introduced.			

Module 27

Code	Course/Module Title	ECTS	Semester
ELEC-314	Electrical Power 1	5	5
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	2/1	73	52
Description			
The course covers the following topics; most important sources of electrical energy as well as other auxiliary sources. Also, include economical aspects of power system planning and power factor improving. Details about the mechanical design of transmission line and the mathematical models for both calculation of sag and insulators. It covers also the parameters of suspended transmission lines (resistance, inductance and capacitance). And lastly the beginning of characteristics of an overhead transmission lines.			

Module 28

Code	Course/Module Title	ECTS	Semester
ELEC-311	Analog Electronics	5	5
Class (hr./w)	**Lect./Lab./Prac./Tutor**	**SSWL (hr./sem.)**	**USWL (hr./w)**
2	2/1	74	51
Description			
The course is a requirement for the electrical engineering students. It introduces the principles, operation, and design of different types of modulation: amplitude modulation, frequency modulation and phase modulation. Topics covered the analysis and design of several aspects of modulation and demodulation circuits of AM, FM and PM. In addition, the noise is covered for all modulation types.			

Module 29

Code	Course/Module Title	ECTS	Semester
MATH-301	Numerical Analysis	4	6
Class (hr/w)	**Lect/<u>Lab</u>./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	1	45	55
Description			

The course is a requirement for the electrical engineering students. It introduces the principles of Numerical Analysis subjects are required in electrical engineering. It enables students to study use these topics with the other electrical engineering courses.

Topics covered are: System of Linear Algebraic Equations, Open Methods to Estimate Root, Curve Fitting, Numerical Integration, Numerical Differentiation, Ordinary Differential Equations, Partial Differential Equations.

Module 30

Code	Course/Module Title	ECTS	Semester
ELEC-317	Computer Engineering I	5	5
Class (hr/w)	**Lect/<u>Lab</u>./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	2/1	74	51
Description			

This module covers the fundamental concepts of computer engineering, including the history and technology of computers, instruction set architecture, computer arithmetic operations. The module starts with an introduction to the history of computers and their performance and power requirements. It then moves on to cover the instruction set architecture of the RISC-V processor, including its programming techniques. The module then covers computer arithmetic operations and the techniques used in their implementation.

Module 31

Code	Course/Module Title	ECTS	Semester
ELEC-326	Digital Communications	5	6
Class (hr./w)	**Lect./Lab./Prac./Tutor**	**SSWL (hr./sem.)**	**USWL (hr./w)**
2	2/1	74	51
Description			

The course is a requirement for the electrical engineering students. It introduces the principles, analysis of digital modulation such as: amplitude shift king (ASK), frequency shift king (FSK), and phase shift king (PSK). Analysis and design of pulse code modulation with different types of signal (RZ,NRZ, RB,…).
Topics covered the theoretical analysis and design of pulse amplitude modulation, pulse width modulation, pulse width modulation. The block diagram and electrical circuits of delta modulation and adaptive delta modulation are analysed.

Module 32

Code	Course/Module Title	ECTS	Semester
ELEC-323	Machines AC 2	6	6
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	1/2/1	88	62
Description			

This course intends to verify fundamental knowledge of introduction and Construction of single phase induction motor. Presentation single phase types and principles of operation. Then explain the synchronous generator construction and salient and non-salient pole types. Parallel operation of synchronous generators are discussed. Synchronous motor construction are also introduced.

Module 33

Code	Course/Module Title	ECTS	Semester
ELEC-354	Electrical Power 2	5	6
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	1/1/1	73	52
Description			

The course covers the following topics; the completing of characteristics of an overhead transmission lines. And it also covers an important phenomenon that cause some lose in the electrical power (Corona Power lose phenomenon). Then going forward with the last topic of transmission subject, which is the underground cable. The last basic of electrical power (distribution), is also studied in this course in both types (A.C and D.C). Lastly, the second course of electrical power covers protection and some electrical devices (transducers, relays and circuit breakers)

Module 34

Code	Course/Module Title	ECTS	Semester
ELEC-321	Digital Electronics	5	6
Class (hr./w)	**Lect./Lab./Prac./Tutor**	**SSWL (hr./sem.)**	**USWL (hr./w)**
2	2/1	74	51
Description			

This course guide to establish fundamental knowledge of active filter, Filter concepts, to study basic principal of filter of circuits and various types. Filter approximations, active RC filter design. Ladder design, Oscillator concepts, types. RC and LC oscillator, crystal oscillator. Power amplifiers types. Class A, class B, class AB and push-pull amplifiers. current mirror, current repeater. Wilder current sources. Bipolar technology RTL, DTL, TTL, IC fabrication process, IC components (transistor, capacitor), phase looked loop PLL.

Module 35

Code	Course/Module Title	ECTS	Semester
ELEC-327	Computer Engineering 2	5	6
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	2/1	74	51
Description			

This module covers the fundamental concepts of computer engineering, including the data-path and pipeline, memory technologies, and parallel processors. The module introduce design of the data-path and pipeline of processors. Then introduces memory technologies, including cache, virtual memory, and performance optimization techniques, and covers parallel processors and their architectures.

Module 36

Code	Course/Module Title	ECTS	Semester
MATH-302	Engineering Statistics and Probability	4	6
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2		45	55
Description			

The course is a requirement for the electrical engineering students. It introduces the principles of engineering statistics and probability subjects are required in electrical engineering. It enables students to use these topics with the other electrical engineering courses especially in digital communication systems.
Topics covered are: Data collection and data representation, Central and Variation measurements, Principles of probability theory, Correlation and Regression, Hypotheses and Fitness tests, Test of

variation, one-way test, two-way test.

Module 37

Code	Course/Module Title	ECTS	Semester
ELEC-411	Digital Signal Processing	5	7
Class (hr./w)	Lect./Lab./Prac./Tutor	SSWL (hr./sem.)	USWL (hr./w)
2	2/1	74	51
Description			

The course is a requirement for the electrical engineering students. It introduces the principles, concepts of digital signal processing (DSP) and presents a general DSP block diagram.
Topics covered the sampling theorem, some practical consideration for designing analog and digital filters are included. Discrete Fourier transforms (DFT) and fast Fourier transform (FFT) are demonstrated. Finite impulse response (FIR) and infinite impulse response (IIR) are analyzed and implemented using direct-form I, direct-form II, cascade and parallel methods.

Module 38

Code	Course/Module Title	ECTS	Semester
ELEC-413	Digital system Design	7	7
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/ sem)
4	2	87	88
Description			

Digital system design" is a core course. This course introduces the student to the design of digital logic circuits, both combinational and sequential, and the design of digital systems in a hierarchical, top-down manner. The student is also introduced to the use of computer-aided design tools to develop complex digital circuits and to prototyping designs using programmable logic devices and field-programmable gate arrays.

Module 39

Code	Course/Module Title	ECTS	Semester
ELEC-414	Power System Analysis	5	7
Class (hr/w)Lec.	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	1/1	59	66
Description			

An electric power system is defined as a network of electrical components used to supply generate, transmit and consume electric power. An electric power system that supplies power to homes and industries is called as grid. The aims of module To provide the student with an advanced and systematic understanding of the operation of a modern electricity network, under both steady state and fault conditions and the techniques used for network analysis and design.

Module 40

Code	Course/Module Title	ECTS	Semester
ELEC-415,	Engineering Control I	5	7
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	2/1	74	51
Description			
Control Systems is the study of the analysis and regulation of the output behaviors of dynamical systems subject to input signals. The concepts and tools discussed in this course can be used in a wide spectrum of engineering disciplines such as mechanical, electrical engineering. The emphasis of this course will be on the basic theories and feedback controller design methods of linear time-invariant systems.			

Module 41

Code	Course/Module Title	ECTS	Semester
ELEC-418	Computer Network	4	7
Class (hr./w)	**Lect./Lab./Prac./Tutor**	**SSWL (hr./sem.)**	**USWL (hr./w)**
2	1	45	55
Description			
This course on Computer Network provides students with a comprehensive understanding of modern networking principles, technologies, and practices. Topics covered include network architectures, protocols, IP addressing, subnetting, LAN and WAN technologies, network security, and network management. Students will gain practical skills in designing, configuring, and troubleshooting computer networks. Emerging network technologies, such as cloud computing and IoT, are also introduced. This course prepares students for careers in network administration and engineering.			

Module 42

Code	Course/Module Title	ECTS	Semester
ENG-407	Graduation Project1	4	7
Class (hr./w)	**Lect./Lab./Prac./Tutor**	**SSWL (hr./sem.)**	**USWL (hr./w)**
	2	30	70
Description			
Preparatory studies of the literature and data collection for the graduation project in a particular area of concentration and under the supervision of one of the faculty members. The course covers directed readings in the literature of civil engineering, introduction to research methods, seminar discussions dealing with special engineering topics of current interest. Planning, design, construction and management of an engineering project. Writing a technical report.			

Module 43

Code	Course/Module Title	ECTS	Semester
ELEC-421	Information Theory	5	8
Class (hr./w)	**Lect./<u>Lab</u>./Prac./<u>Tutor</u>**	**SSWL (hr./sem.)**	**USWL (hr./w)**
2	2/1	74	51
Description			

The course is a requirement for the electrical engineering students. It introduces the principles, concepts of information theory including: self-information, mutual information, joint and conditional probability density function.

Topics covered the calculation of probability density function of different types of events, entropy and information. The efficiency and redundancy for Shannon fano and Hoffman codes are covered. Some types of channel coding such as: block, Hamming, cyclic and convolutional codes are also included.

Module 44

Code	Course/Module Title	ECTS	Semester
ELEC-422	Power Electronics	8	8
Class (hr/w)	**Lect/<u>Lab</u>./Prac./<u>Tutor</u>**	**SSWL (hr/sem)**	**USWL (hr/w)**
4	2/2	116	84
Description			

The course is a requirement for the electrical engineering students. It introduces the principles, operation, and design of power electronics converter circuits, topologies, control techniques, and applications, analysis, losses and protection of power semiconductor devices.

Topics covered the design of power circuits including rectifiers, DC-DC converters, AC-AC converter and inverters.

Module 45

Code	Course/Module Title	ECTS	Semester
ELEC424	Power System Protection	4	8
Class (hr/w)	**Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	1	45	55
Description			

Electric power systems are becoming increasingly complex in nature due to the integration of distributed energy resources. This module covers introduction to power system protection, which is a branch of electrical power engineering that deals with the protection of electrical power systems from defining the faults through the isolation of this fault. The objective of a power system protection is to keep the power system stable by isolating only the components that are under fault, whilst leaving as much of the network as possible still in operation. Thus, protection schemes must apply a very pragmatic and pessimistic approach to clearing system faults. The protection devices that are used to protect the power systems from faults. This module includes introduces the fundamentals of power

system protection.. After that, the components of protection system will be explained. The coordination and management of the protection devices will be presented . the schemes of protection of power system components will be reviewed.

Module 46

Code	Course/Module Title	ECTS	Semester
ELEC-425	Engineering Control II	5	8
Class (hr/w)	**Lect/<u>Lab.</u>/Prac./<u>Tutor</u>**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	2/1	74	51
Description			

Control Systems is the study of the analysis and regulation of the output behaviors of dynamical systems subject to input signals. The concepts and tools discussed in this course can be used in a wide spectrum of engineering disciplines such as mechanical, electrical engineering. The emphasis of this course will be on the basic theories and feedback controller design methods of linear time-invariant systems.

Module 47

Code	Course/Module Title	ECTS	Semester
EE428	Antenna and Propagation	4	8
Class (hr/w)	**Lect/Lab./Prac./<u>Tutor</u>**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	1	45	55
Description			

This course teaches the fundamentals of antenna and shows the application in practical examples. The course covers the theory of radiation, fundamental antenna parameters and concept s, wire antennas such as dipoles and loop antennas, antenna arrays, aperture antennas (e.g. horns), microstrip antennas

Module 48

Code	Course/Module Title	ECTS	Semester
ENG-427	Graduation Project 2	4	8
Class (hr./w)	**Lect./Lab./<u>Prac.</u>/Tutor**	**SSWL (hr./sem.)**	**USWL (hr./w)**
0	2	30	70
Description			

Preparatory studies of the literature and data collection for the graduation project in a particular area of concentration and under the supervision of one of the faculty members. The course covers directed readings in the literature of civil engineering, introduction to research methods, seminar discussions dealing with special engineering topics of current interest. Planning, design, construction and management of an engineering project. Writing a technical report.

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