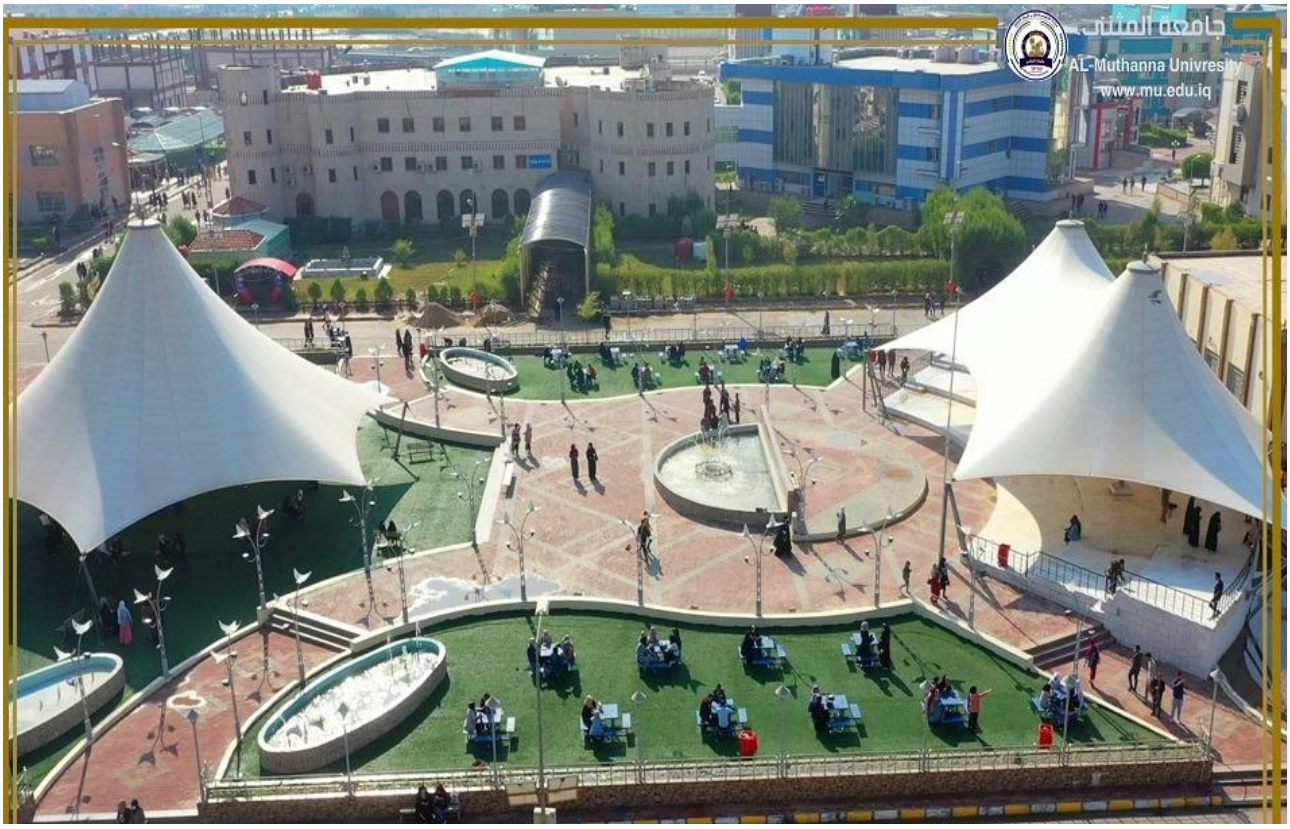
الملحق 3 : دليل المواد الدراسية

Program Catalogue | 2025 - 2026 | دليل المواد الدراسية

Al – Muthanna University
College of Engineering

First Cycle - Bachelor's degree (B.SC.) – Electronic and Communications Engineering

بكالوريوس – هنسة الكترونية واتصالات



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1. Overview

This catalogue is about the courses (modules) given by the program of Electronic and Communication Engineering to gain a Bachelor of Science degree. The program delivers (49) modules with (6000) total student workload hours and 240 total ECTS. The module delivery is based on the Bologna Process.

نظرة عامة

يتناول هذا الدليل المواد الدراسية التي يقدمها قسم الهندسة الالكترونية والاتصالات للحصول على درجة بكالوريوس العلوم. يقدم البرنامج (49) ماده دراسية مع (6000) اجمالي ساعات حمل الطالب و (240) اجمالي وحدات اوربية. يعتمد تقديم المواد الدراسية على مسار بولونيا.

2. Undergraduate Courses 2023-2024

Module: 1

Code	Course/Module Title	ECTS	Semester
ENG001	Mathematic I	6	1
Class(hr/w)	**Lect/Lab/Prac./Tutor**	**SSWL(hr/w)**	**USWL(hr/w)**
3	1	63	87
Description			
The study of numbers, equations, functions, and geometric shapes (see geometry) and their relationships. Some branches of mathematics are characterized by use of strict proofs based on axioms. Some of its major subdivisions are arithmetic, algebra, geometry, and calculus. Per the Department's program assessment outcomes, by the end of this course you should demonstrate the following relevant to mathematic: 1) an ability to apply knowledge of mathematics, 2) an ability to conduct the main concepts of Applications of Derivatives , 3) the ability to develop the functions & rational functions 4) Analyze Graph the Function, 5)Limit and Continuous. 6) an of Trigonometric functions, 7) an ability to understanding Methods of Integration, 8) an education necessary to understand the impact of Applications of Definite Integrals, and 9) an ability to use the techniques, skills, and modern engineering tools necessary for Matrix.			

Module :2

Code	Course/Module Title	ECTS	Semester
ECE112	Electrical circuits I	8	1
Class(hr/w)	**Lect/Lab/Prac./Tutor**	**SSWL(hr/w)**	**USWL(hr/w)**
3	4	107	93
Description			
This module introduces students to the fundamental principles of electronics, and how to design, build and test simple analogue and digital circuits. This module introductory course to the fundamentals and basic principles of DC circuits. Topics include: resistance, voltage, current, Ohm's Law, Kirchhoff's Laws, power, superposition, network theorems, Thevenin's and Norton's Theorems, maximum power transfer,. Laboratory hours complement class work			

Module : 3

Code	Course/Module Title	ECTS	Semester
ECE113	Electronic Physics	7	1
Class(hr/w)	**Lect/Lab/Prac./Tutor**	**SSWL(hr/w)**	**USWL(hr/w)**
3		48	127
Description			
This course provides a background on the Mechanical, Electrical & thermal properties. This includes the Chemical and Magnetic properties and atomic Thomson model of the atom, Rutherford Model of the Atom. Moreover, topics of Wave nature of Light, Dual nature of Light, Probability and wave Function are given in this course. Electronic physics contains the analyze of the One dimension Electronic Wave, Two dimension and Three dimension Electronic Wave as well as Wave Function and the four quantum number. Furthermore, this course provides background of Pauli principle and quantization of energy and the Electronic charge distribution as well as Bounding , Hydrogen molecule, Ionic bound, covalent bound.			

Module: 4

Code	Course/Module Title	ECTS	Semester
ENG003	Engineering Drawing	4	1
Class(hr/w)	**Lect/Lab/Prac./Tutor**	**SSWL(hr/w)**	**USWL(hr/w)**
1	3	63	37
Description			
This course was designed in a way that you learn Engineering Drawing is that engineering activity is concerned with the exportation of conducting methods and it is applications on a commercial scale. The objectives are to introduce the students to use drawing instruments and to draw various types of line and engineering methods such as divided the lines, the curves, and draw polygon, and etc. However, the basics to build the concepts for image the orthographic projection, shapes, and plans. Also, the students have ability to make drawing in 3D view through isometric with different positions inclined to one of the plans. In additional to support the engineering drawing idea by using computer aided design software to creating drafting symbols, lines and figure (circle, rectangular, and etc.) modify objects on figures.			

Module : 5

Code	Course/Module Title	ECTS	Semester
UNI115	**Computers** I	3	1
Class(hr/w)	**Lect/Lab/Prac./Tutor**	**SSWL(hr/w)**	**USWL(hr/w)**
1	2	48	27
Description			
For hardware, a module is an assembly of parts designed to be added and removed from a larger system easily. An example of a hardware module is a stick of RAM. Most modules are not functional on their own. They need to be connected to a larger system or be part of a system made up of several modules. The concept of modularity or being made up of modules is common in computer hardware. A modular system has many advantages allowing for ease of repair, upgrade and extension of functionality. The various modules can be swapped out as needed. Standardization of hardware as interconnects enables several vendors to produce modules creating better choice for consumers.			

Module 6

Code	Course/Module Title	ECTS	Semester
UNI116	Arabic Language	3	1
Class(hr/w)	**Lect/Lab/Prac./Tutor**	**SSWL(hr/w)**	**USWL(hr/w)**
2		31	44
Description			
تعد اللغة العربية هوية للناطقين بها، ورابط يوحدهم ويميزهم من سائر شعوب العالم، فلذلك يسعى المقرر إلى خدمة هذه اللغة واالعتناء بها ونشر قواعدها، لتبقى حية فيما تنطق به االلسنة، وما تسطر به االقالم، ولتظل وعاء للفكر والعلم يصان ويعتنى به على مر العصور. يشمل هذا المقرر تغطية مفاهيم اللغة العربية :النحو: يهدف هذا المقرر لضبط قواعد التركيب الخاص بالجملة؛ وذلك بدراسة قواعد اللغة العربية، وهي أقسام الكالم ودراسة القضايا المشتركة بين تلك االقسام ثم يبدأ ببعض قضايا االسم والفعل والحرف والمعرب والمبني، والنكرة والمعرفة، ومرفوعات االسماء ومنها المبتدأ والخبر، والفاعل، ونائب الفاعل، وبعض مواضيع منصوبات االسماء، ويعنى في كل ذلك بالتدريبات المناسبة .الصرف: ويهدف إلى دراسة القضايا المتعلقة بالكلمة وما يطرأ عليها من تغيير، فيدرس مباحث الفعل وتقسيماته، الصحيح، والمعتل، ويعنى في كل ذلك بالتدريبات المناسبة . اإلمالء والتعبير: ويهدف إلى دراسة القضايا التي تواجه المتعلم أثناء الكتابة، فضالً عن اهتمامه بتنظيم الكتابة التناسق محققا واالنسجام بين أجزاء الكالم والجمل وذلك من أجل الكتابة الصحيحة والتعبير السليم وتقويم لسانً التاء المربوطة والمفتوحة، فضالً المتعلم؛ فهو يدرس موضوع الفرق بين الضاد والظاء، وقواعد كتابة عن قواعد كتابة همزة الوصل والقطع، وعالمات الترقيم والتنقيط ويعنى في كل ذلك بالتدريبات المناسبة .االدب: ويهدف إلى تنمية ذوق الطالب االدبي وإثراء تحصيله وإغناء زاده من الفكر العربي واإلسالمي.			

Module : 7

Code	Course/Module Title	ECTS	Semester
ENG005	Mathematic II	6	2
Class(hr/w)	**Lect/Lab/Prac./Tutor**	**SSWL(hr/w)**	**USWL(hr/w)**
3	1	63	87
Description			
To reach the general course goals, specific objectives were developed for each section of material that describe the concepts that I consider most critical for you to take from this course: Identify the mechanisms of Composite numbers simultaneously in practice, and develop an awareness of Trigonometric functions with Hyperbolic functions, and solve various mathematic problems encountered in practice Per the Department's program assessment outcomes, by the end of this course you should demonstrate the following relevant to mathematic: 1) an ability to apply knowledge of mathematics, 2) an ability to conduct the main concepts of Applications of Derivatives , 3) the ability to develop owe functions & rational functions 4) Analyze Graph the Function, 5)Limit and Continuous. 6) an of Trigonometric functions, 7) an ability to understanding Methods of Integration, 8) an education necessary to understand the			

impact of Applications of Definite Integrals, and 9) an ability to use the techniques, skills, and modern engineering tools necessary for Matrix.

Module :8

Code	Course/Module Title	ECTS	Semester
ECE122	Electrical circuits II	8	2
Class(hr/w)	**Lect/Lab/Prac./Tutor**	**SSWL(hr/w)**	**USWL(hr/w)**
3	4	107	93
Description			
This course is designed to provide a complete overview of AC electric circuit analysis used in electrical engineering and electronics engineering. In this course you will learn everything about AC electric circuits and electronics, from the basics such as what sinusoids are, all the way to key characteristics of AC circuits such as impedance, admittance, power factor, and complex power. Laboratory hours complement class work			

Module : 9

Code	Course/Module Title	ECTS	Semester
UNI123	Human Rights & Democracy	3	2
Class(hr/w)	**Lect/Lab/Prac./Tutor**	**SSWL(hr/w)**	**USWL(hr/w)**
2	-	31	44
Description			
تضمن هذا المنهاج تعريف شامل ومركز بحقوق الإنسان ابتداء من جذور نشأتها والتطورات التي شهدتها هذه الحقوق الإنسانية عبر العصور والمجتمعات البشرية وإسهام الشرائع السماوية والأديان والحضارات في رفدها بالقيم والمثل مرورا بمختلف العصور. كذلك يشمل تفعيل العقل والتفكير والإبداع والحرص على المشاركة الديمقراطية بكل تفاصيلها ومبادئ العدالة الاجتماعية.			

Module : 10

Code	Course/Module Title	ECTS	Semester
ECE124	Electronic Materials	8	2
Class(hr/w)	**Lect/Lab/Prac./Tutor**	**SSWL(hr/w)**	**USWL(hr/w)**
3	1	107	93
Description			
This course provides a background on the Energy bound Theory in Crystals. This includes the understanding of the Conductors, Semiconductor and insulator, Fermi level, the electrical conduction. Moreover, topics of the metallic crystal under magnetic field , the resistance, temperature, and super conductivity are given in this course. Electronic materials contains a detailed background on semiconductors, The crystal structure representative as well as the intrinsic semiconductor and intrinsic conductors. Furthermore, this course provides background of P-N junction, diode equation and biasing and the junction transistors.			

Module : 11

Code	Course/Module Title	ECTS	Semester
UNI125	Technical English Language I	4	2
Class(hr/w)	**Lect/Lab/Prac./Tutor**	**SSWL(hr/w)**	**USWL(hr/w)**
2	-	32	68
Description			
This course provides an introduction to improve the student's ability to communicate and their linguistic competence in English language. In this course the beginner level would be sufficient for very simple interactions, for example as a basic greeting, description of the city, and their appearance and personalities. Also talk about the daily activities and arrange meetings with friends and colleagues. Describe current weather conditions and suggest common actives according to the weather forecast. Although progress of their ability will depend on the type of course to reach the level A1 in English skills.			

Module : 12

Code	Course/Module Title	ECTS	Semester
ENG126	Workshop Technology	4	2
Class(hr/w)	**Lect/Lab/Prac./Tutor**	**SSWL(hr/w)**	**USWL(hr/w)**
-	3	47	53
Description			
Workshop is the core of learning about different Materials, equipment, tools and manufacturing practices that are observed in different manufacturing functions and operations. Workshop is also of prime importance when you want to gather about the practical knowledge. What is the role of an engineer in workshop? Overview Take complete responsibility for specific workshop jobs. Main activities will be dismantling, cleaning, inspecting, repairing, assembling and testing diesel engines spares and assemblies. Will need a “hands-on” approach to other mechanical engineering projects. What is the importance of learning workshop basics for an engineer? The workshop experiences would help to build the understanding of the complexity of the industrial job, along with time and skills requirements of the job. Workshop curricula build the hands on experiences which would help to learn manufacturing processes and production technology courses in successive semesters. What are the types of engineering workshop? The Engineering Workshops consist of the Machine Shop (metal work), the Fitting Shop, the Foundry, the Smithy, the Welding shop, the Carpentry Shop and the Motor Vehicle Repair Unit and Service Facility.			

Module 13

Code	Course/Module Title	ECTS	Semester
ECE211	Mathematic III	6	3
Class(hr/w)	**Lect/Lab/Prac./Tutor**	**SSWL(hr/w)**	**USWL(hr/w)**
3	1	63	87
Description			
Per the Department's program assessment outcomes, by the end of this course you should demonstrate the following relevant to mathematic: 1) an ability to apply knowledge of Laplace transformer, 2) an ability to conduct the main concepts of Gamma functions , Bessel's equations , Legendre equation 3) the ability to develop ower Z transform : direct Z transform , invers Z transform 4) Analyze vector, 5)Second order differential equations: undetermined coefficients, variation of parameters . 6) an of Triple integral : in Cartesian coordination , cylindrical , spherical coordination , 7) an ability to understanding Fourier series, 8) an education necessary to understand the impact of inverse of Fourier transform, and 9) an ability to use Exponential form of Fourier series, engineering applications.			

Module 14

Code	Course/Module Title	ECTS	Semester
ECE212	Electronics I	8	3
Class(hr/w)	**Lect/Lab/Prac./Tutor**	**SSWL(hr/w)**	**USWL(hr/w)**
3	3	94	106

Description

This Course is for Students having background in analog Electronics and basic of semiconductor or any relevant stream. This Course is also called as Analog Circuits have an experience in any Circuit Design Course based on a Theoretical and Analytical of the semiconductors (diode , transistor). This Course is exclusively made from Beginners point of introduction to electronic and push the student to learn building Circuits Design Sense. This course will focus on different topics with this Course like Operational Amplifiers, Diodes, **Transistors based on the Dc power supply.** Also this section will able to handle any Problem in Analog Circuits after finishing this Course . *This is a basic Analog Electronics Course. This course covers all basic concepts related to P-N Junction Diode, Special purpose diodes, Bipolar Junction Transistor and Field Effect Transistor .The complete course is divided into three sections. Section-1 covers basic concepts of P-N junction diode, special purpose diodes-Zener Diode, LED, Photodiode and Diode applications-Rectifiers, Clipping Circuits & Clamping Circuits. Section-2 covers concepts of Bipolar junction Transistor including construction, working and Input-Output Characteristics of BJT*

Module 15

Code	Course/Module Title	ECTS	Semester
ECE213	Network Analysis I	3	3
Class(hr/w)	**Lect/Lab/Prac./Tutor**	**SSWL(hr/w)**	**USWL(hr/w)**
2	0	32	43
Description			
This course provides a comprehensive introduction to electrical Network analysis and energy storage elements. Students will learn about the fundamental principles and characteristics of inductance, capacitance, and mutual inductance. The course covers various topics, including series-parallel combinations of energy storage elements and their applications in circuit analysis. The course begins with an exploration of energy storage elements, focusing on inductance, capacitance, and mutual inductance. Students will gain an understanding of their properties, behavior, and applications in electrical circuits. The series and parallel combinations of energy storage elements will be coverd. Students will learn how to solve and analyze the circuits that involve Natural and Step Response of First-Order RL and RC Circuits. They will explore the time constant, general solution, and transient behavior of these circuits under different initial conditions. Sequential Switching will be covered also and learn how to analyze circuits that involve the switching on and off of energy storage elements. The course covers the natural and step responses of second-order series and parallel RLC (resistor-inductor-capacitor) circuits. Students will explore the behavior of these circuits under different damping conditions, including underdamped, critically damped, and overdamped responses. Students will learn the general solution techniques for second-order RLC circuits.			

Module 16

Code	Course/Module Title	ECTS	Semester
ECE214	Electromagnetic fields I	5	3
Class(hr/w)	**Lect/Lab/Prac./Tutor**	**SSWL(hr/w)**	**USWL(hr/w)**
3	1	62	63
Description			
Electromagnetics provides the mathematical description of all electrical phenomena, and therefore it is the physical foundation of all Electrical and Computer Engineering disciplines. Modern applications of electromagnetics are broad and include wireless communication systems, global navigation systems, bioelectrical phenomena, high speed computers and computer networks, and electromagnetic phenomena in Earth's near-space environment (space weather) as well as electrical, optical, and photonic devices. This course provides instruction in the fundamental engineering science and also the basics of modern applications. This course builds on the mathematics concepts learned in EC 212.			

Module 17

Code	Course/Module Title	ECTS	Semester
ECE215	Digital Electronics I	5	3
Class(hr/w)	**Lect/Lab/Prac./Tutor**	**SSWL(hr/w)**	**USWL(hr/w)**
2	2	63	62
Description			
This course provides an introduction to the fundamentals of combinational logic, Boolean algebra, digital arithmetic, sequential logic, and microprocessor instruction set architecture and I/O for the second year students. Learning opportunities include: lectures with integrated practice exercises; tutorials in which small teams work together to explore, discuss, analysis and explain digital electronic circuits; and practical's in which theory is put to useful application. The course is designed to be one of the first undertaken by new students in electronic and communication engineering, such that its successful completion will provide the necessary foundation for more specialist is learning in digital microelectronics and computer engineering.			

Module: 18

Code	Course/Module Title	ECTS	Semester
UNI126	Computers II	4	3
Class(hr/w)	**Lect/Lab/Prac./Tutor**	**SSWL(hr/w)**	**USWL(hr/w)**
2	2	64	36

Description

This is a fast-paced introductory course to the C++ programming language. It is intended for those with little programming background, though prior programming experience will make it easier, and those with previous experience will still learn C++-specific constructs and concepts.

By the end of this course, you should be able to:

- Understand and use the basic programming constructs of C/C++
- Manipulate various C/C++ datatypes, such as arrays, strings, and pointers
- Isolate and fix common errors in C++ programs
- Use memory appropriately, including proper allocation/deallocation procedures
- Write small-scale C++ programs using the above skills

Module 19

Code	Course/Module Title	ECTS	Semester
ECE221	Mathematic IV	5	4
Class(hr/w)	**Lect/Lab/Prac./Tutor**	**SSWL(hr/w)**	**USWL(hr/w)**
3	1	62	63
Description			
This course was designed in a way such that you learn that mathematics is that engineering activity concerned with the exploitation of conducting methods and it is applications on a commercial scale. Its goal is the successful to present the basic of Per the Department's program assessment outcomes, by the end of this course you should demonstrate the following relevant to mathematic: 1) an ability to apply knowledge of Laplace transformer, 2) an ability to conduct the main concepts of Gamma functions , Bessel's equations , Legendre equation 3) the ability to develop owe Z transform : direct Z transform , invers Z transform 4) Analyze vector, 5)Second order differential equations: undetermined coefficients, Variation of parameters . 6) an of Triple integral : in Cartesian coordination , cylindrical , spherical coordination , 7) an ability to understanding Fourier series, 8) an education necessary to understand the impact of inverse of Fourier transform, and 9) an ability to use Exponential form of Fourier series, engineering applications.			

Module 20

Code	Course/Module Title	ECTS	Semester
ECE222	Electronics II	7	4
Class(hr/w)	**Lect/Lab/Prac./Tutor**	**SSWL(hr/w)**	**USWL(hr/w)**
3	3	94	81

Description

This course on Analog Electronic Circuits has been designed primarily as a core course for undergraduate students. It starts with basic circuit components and circuit concepts and then, gradually moves to practical building blocks of analog electronic systems. This course will focus on different topics with this Course like Operational Amplifiers, Diodes, **Transistors based on the AC power supply. Inthis s**ection covers introduction to Multistage Amplifiers (Block Diagram, Gain Calculation, Gain in Decibels , Different types of Coupling arrangements : R-C Coupling, Transformer Coupling, Direct Coupling, Advantages & Disadvantages of Coupling, Comparison between Coupling Schemes, R-C Coupled Amplifier, AC & DC Equivalent Circuit of R-C Coupled Amplifier), Distortions in Amplifiers, Feedback Amplifiers, Oscillators and Power Amplifiers. Also , this section will focus on introduction to Differential Amplifiers, Operational Amplifiers, internal structure of an Operational- Amplifier, Characteristics of an ideal Operational Amplifier, Non idealities in an Operational Amplifier (Output offset voltage, input bias current, input offset current, slew rate, gain bandwidth product), and frequency response with different classes of the operation amplifier.

Module 21

Code	Course/Module Title	ECTS	Semester
ECE223	Network Analysis II	4	4
Class(hr/w)	**Lect/Lab/Prac./Tutor**	**SSWL(hr/w)**	**USWL(hr/w)**
2	1	47	53

Description

This course provides a comprehensive introduction to the Laplace Transform and its applications in Electrical Network Analysis. Students will develop a solid understanding of the Laplace Transform, its properties, and its use in solving differential equations that arise in electrical circuits. The course covers a range of topics, including transfer functions, steady-state sinusoidal response, convolution integral, and frequency-selective circuits.

Students will learn the basics of the Laplace Transform, including its definition, properties, and advantages over traditional time-domain analysis. They will understand the concept of transforming time-domain signals into the frequency domain using complex algebra. The course covers the step function and impulse function, their mathematical definitions, and their significance to represent different types of inputs and disturbances in electrical circuits. The concept of poles and zeros of the Laplace Transform will be covered and understanding how these complex values influence the behavior and stability of electrical systems.

The course emphasizes the use of Laplace Transforms in analyzing electrical circuits. Students will learn how to decompose complex transfer functions into simpler fractions and use convolution to analyze the response of linear time-invariant (LTI) systems to arbitrary inputs. Steady-State Sinusoidal Response and Frequency Selective Circuits will be explored in this course. Students will learn about the characteristics and analysis of filters, such as low-pass, high-pass, bandpass, and band-stop filters, using Laplace Transforms and transfer functions.

Module 22

Code	Course/Module Title	ECTS	Semester
ECE224	Electromagnetic fields II	5	4
Class(hr/w)	**Lect/Lab/Prac./Tutor**	**SSWL(hr/w)**	**USWL(hr/w)**
3		47	78
Description			
This course examines electric and magnetic quasistatic forms of Maxwell's equations applied to the dielectric, conduction, and magnetization boundary value problems. Topics covered include: electromagnetic forces, force densities, and stress tensors, including magnetization and polarization; thermodynamics of electromagnetic fields, equations of motion, and energy conservation; applications to synchronous, induction, and commutator machines; sensors and transducers; microelectromechanical systems; propagation and stability of electromechanical waves; and charge transport phenomena. This course builds on the fundamental EM field concepts learned in EC 214.			

Module 23

Code	Course/Module Title	ECTS	Semester
ECE225	Digital Electronics II	5	4
Class(hr/w)	**Lect/Lab/Prac./Tutor**	**SSWL(hr/w)**	**USWL(hr/w)**
2	2	64	61
Description			
This course provides an introduction to the fundamentals of sequential circuits with two types; the synchronous and asynchronous, counters, This course provides an introduction to flip flops, latches, applications of flip flops (counters and shift registers) and the memory and storage device for the second year students who had previous knowledge in combinational circuits. (Prerequisite: EE- 215). Learning opportunities include: lectures with integrated practice exercises; tutorials in which small teams work together to explore, discuss, analysis and explain digital electronic circuits; and practical's in which theory is put to useful application. The course is designed to be one of the first undertaken by new students in electronic and communication engineering, such that its successful completion will provide the necessary foundation for more specialist is learning in digital microelectronics and computer engineering.			

Module 24

Code	Course/Module Title	ECTS	Semester
UNI266	Technical English Language II	4	4
Class(hr/w)	**Lect/Lab/Prac./Tutor**	**SSWL(hr/w)**	**USWL(hr/w)**
2	-	32	68
Description			
This course provides to enable students to improve both their ability to communicate and competence in English language. They can understand the main points of clear texts on the daily familiar topics in standard language. Also, explore the international culture and history, engage in dialogue on topics of relevant interest to tutors, and gain confidence in reading, writing, and speaking the English language. The main idea of this course is to improve their vocabulary, grammar, pronunciation, and conversation skills. The main focusing is reading paragraphs and articles, identify the various forms and types of articles, explain the diverse text and strategies employed by reader which being base on the next level of English Learning.			

Module: 25

Code	Course/Module Title	ECTS	Semester
ECE311	Communication Systems I	8	5
Class(hr/w)	**Lect/Lab/Prac./Tutor**	**SSWL(hr/w)**	**USWL(hr/w)**
3	3	94	106
Description			
The Communication Systems module provides you with a detailed understanding of how communication systems work, from theoretical concepts through to the design of practical communication systems. Topics include: Signal models, energy and power signals. The Fourier Series and its properties, forms, table, and line spectra. The Parseval's power theorem. The Fourier Transforms including properties, theorems, pairs, and Fourier Transforms of periodic signals. The power spectral density, correlation functions of energy signals, correlation functions and autocorrelation of power signals, and Rayleigh's energy theorem. The LTI systems, linear distortion, ideal filters, and practical filters. The amplitude modulation including DSB modulation, Conventional AM, SSB modulation, Hilbert Transform, the superheterodyne receiver, interference, and noise. The angle modulation, phase, and frequency modulation, spectrum of an angle-modulated signal, Carson's Rule, direct EM generation, indirect FM generation, and demodulation of angle modulated signals. The multiplexing techniques, frequency division multiplexing, stereophonic FM broadcasting, and quadrature multiplexing.			

Module: 26

Code	Course/Module Title	ECTS	Semester
ECE312	Energy Conversion	4	5
Class(hr/w)	**Lect/Lab/Prac./Tutor**	**SSWL(hr/w)**	**USWL(hr/w)**
3	-	47	53
Description			
This course provides a comprehensive understanding of energy conversion processes and their application in renewable energy systems. Students will explore various topics, including magnetic circuits, transformer principles, types of DC machines, AC machines, controlled switches, diode rectifiers, DC-DC converters, DC-AC inverters, and renewable energy sources such as solar and wind power. The course emphasizes the principles, operations, and circuits associated with energy conversion and the integration of renewable energy sources. They course includes the behavior of magnetic materials, magnetic flux, and magnetic circuits in the context of transformers and electrical machines. The course will be provides different types of DC machines, such as DC generators and DC motors, and also explore various types of AC machines, including synchronous machines and induction machines. Students will learn about different types of controlled switches used in power electronics. The study of the rectification, half-wave and full-wave rectifiers, will be covered. DC-DC and DC-AC Converters will be explored with their applications in power electronics. Students will explore the operation and circuits associated with renewable energy systems. They will study the integration of solar panels, wind turbines, inverters.			

Module : 27

Code	Course/Module Title	ECTS	Semester
ECE313	**Electronic III**	6	5
Class(hr/w)	**Lect/Lab/Prac./Tutor**	**SSWL(hr/w)**	**USWL(hr/w)**
3	1	62	88
Description			
This course provides a background the JFET transistors including the construction and biasing. This includes the understanding of the construction and physical properties of the depletion-mode MOSFET transistors and Enhancement mode MOSFET transistors. Moreover, topics of the biasing networks of MOSFET circuits including the fixed-bias configuration and self-bias configuration are given in this course. Electronic materials contains Design the single stage amplifiers including the common source amplifiers, source followers, and common gate amplifiers as well as the differential amplifiers and the Op-Amp basics and specifications. Furthermore, this course provides the Analysis of the high frequency response in MOSFET amplifiers.			

Module 28

Code	Course/Module Title	ECTS	Semester
ECE314	Wave propagation	3	5
Class(hr/w)	**Lect/Lab/Prac./Tutor**	**SSWL(hr/w)**	**USWL(hr/w)**
2	0	32	43
Description			
This is an important senior level course for students in the electromagnetics and communications area. Greater demand for flexibility and portability has led to a boom in the cellular-radio telephone industry, and recent research efforts by leading telecommunications firms indicate that radio links may replace wires in offices and factories of the future, becoming the more conventional offices and factories of the future. More conventional types of radio communication are used extensively by military and consumer industries throughout the RF spectrum. This course presents fundamental concepts for understanding, evaluating, and predicting radio propagation effects throughout the radio spectrum and in a variety of scenarios. Students planning careers in radar, communication systems, or electromagnetics are introduced to fundamental concepts which govern radio wave propagation. This course illustrates how electromagnetic field theory can be applied to the development of practical design tools such as link budgets. This course builds on the fundamental EM field concepts learned in EC 224.			

Module 29

Code	Course/Module Title	ECTS	Semester
ECE315	Microprocessors	5	5
Class(hr/w)	**Lect/Lab/Prac./Tutor**	**SSWL(hr/w)**	**USWL(hr/w)**
2	3	79	46
Description			
This course provides an introduction to the basic computer organization and introductory microprocessor architecture. Introduction to assembly language programming: basic instructions, program segments, registers, and memory. Control transfer instructions; arithmetic, logic instructions; rotate instructions and bitwise operations in assembly language. Basic computer architecture: pin definitions and supporting chips. Memory and memory interfacing. Basic I/O and device interfacing: I/O programming in assembly and programmable peripheral interface (PPI). Interfacing the parallel and serial ports. (Prerequisite: EE- 215 and EC-225).			

Module: 31

Code	Course/Module Title	ECTS	Semester
ECE321	Communication Systems II	8	6
Class(hr/w)	**Lect/Lab/Prac./Tutor**	**SSWL(hr/w)**	**USWL(hr/w)**
3	3	94	106
Description			

The Communication Systems module provides you with a detailed understanding of how communication systems work, from theoretical concepts through to the design of practical communication systems. Topics include:

Aspects of Digital-to-Analog Conversion: Data Element Versus Signal Element, Data Rate Versus Signal Rate, Bandwidth, Carrier Signal.

Digital Transmission of Analog Signals: Sampling Theorem and its applications.

Pulse Amplitude Modulation, Pulse Width Modulation, Pulse Position Modulation (generation and Demodulatron).

Quadrature Amplitude Modulation (generation and Demodulation), Multidimensional Signaling.

Signaling Schemes with Memory: CPFSK, and CPM. Digital Representation of Analog Signals, Pulse Code Modulation (PCM).

PCM System Issues in digital transmission: Time Division Multiplexing, TDM Hierarchy.

Multicarrier Modulation and OFDM.

Digital-to-digital conversion: line coding, block coding, and scrambling.

Differential Pulse Code Modulation, Delta Modulation. Adaptive Delta Modulation, Voice Coders.

Phase-Shift Keying, Frequency-Shift Keying, Amplitude-Shift Keying, QASK, QFSK, and QPSK.

Emerging digital communication technologies: Artificial intelligence (AI) and machine learning (ML), Blockchain and Web3 technology, Intelligent automation and robotic process automation (RPA), Internet of things (IoT), Quantum computing.

Quality of Service (QoS): Delay, Reliability, Jitter.

Module 32

Code	Course/Module Title	ECTS	Semester
ECE322	Information Theory and coding	5	6
Class(hr/w)	**Lect/Lab/Prac./Tutor**	**SSWL(hr/w)**	**USWL(hr/w)**
3	0	47	78
Description			
This course provides to enable students to can understand the main ideas of complex text and sentences on both concrete and abstract topics, including technical discussions in his or her field of specialization. Their abilities will be improving by participate in meetings in the classmate and understanding their idea. Talk about education, experience, strengths and weaknesses, and discuss your career path. Using appropriate language in social stations, including praising and expressing, sympathy, synonymous and antonymous. Talk about qualities of text and how you can deal with it and analyses. Although progress will depend on the type of this course and the previous level of a cumulative instruction.			

Module 33

Code	Course/Module Title	ECTS	Semester
ECE323	Antenna	6	6
Class(hr/w)	**Lect/Lab/Prac./Tutor**	**SSWL(hr/w)**	**USWL(hr/w)**
3	0	47	103
Description			
The course will give students a thorough understanding of the fundamental radiation mechanisms of antennas and thereby get an overview of the special characteristics of the most common antenna types. One should also get a good construction background for such antennas as well as an understanding of how the antennas are included in different radio systems Keywords: Fundamental antenna properties. Radiation from general current sources in free space. Array antennas. Analysis of some important types like electrically small antennas, resonant antennas, broadband antennas, and aperture antennas including reflector antennas. The method of moments for computing the current distribution on wire antennas. This course builds on the fundamental EM field concepts learned in EC 314.			

Module 34

Code	Course/Module Title	ECTS	Semester
ECE324	Computer Architecture	4	6
Class(hr/w)	**Lect/Lab/Prac./Tutor**	**SSWL(hr/w)**	**USWL(hr/w)**
2	0	47	53
Description			
This course is a study of the evolution of computer architecture and the factors influencing the design of hardware and software elements of computer systems. Topics may include: instruction set design; processor micro-architecture and pipelining; cache and virtual memory organizations; protection and sharing; I/O and interrupts; in-order and out-of-order superscalar architectures; vector supercomputers; multithreaded architectures; symmetric multiprocessors; and parallel computers			

Module 35

Code	Course/Module Title	ECTS	Semester
ECE 325	Numerical Analysis	7	6
Class(hr/w)	**Lect/Lab/Prac./Tutor**	**SSWL(hr/w)**	**USWL(hr/w)**
3	3	94	81
Description			
This course will emphasize the development of numerical algorithms to provide solutions to common problems formulated in science and engineering. The primary objective of the course is to develop the basic understanding of the construction of numerical algorithms, and perhaps more importantly, the applicability and limits of their appropriate use. The emphasis of the course will be the thorough study of numerical algorithms to understand the guaranteed accuracy, large scale systems, and stability. Topics include the standard algorithms for numerical computation: root finding for nonlinear equations, interpolation and approximation of functions by simpler computational building blocks (for example - polynomials and splines), numerical differentiation and divided differences, numerical quadrature and integration, numerical solutions of ordinary differential equations and boundary value problems. An important component of numerical analysis is computational implementation of algorithms which are developed in the course in order to observe first-hand the issues of accuracy, computational work effort, and stability. Exercises will include computational experiments in a programming language of the student's choice. One class lecture will be devoted to a high level pseudo-code type programming language (Matlab)			

which will suffice in case students have not had prior programming experience. Attendance is required and the exams will be over the lectures and homework.

Module 37

Code	Course/Module Title	ECTS	Semester
ECE412	Microwave Engineering	6	7
Class(hr/w)	**Lect/Lab/Prac./Tutor**	**SSWL(hr/w)**	**USWL(hr/w)**
3	0	47	103
Description			
This course uses electromagnetic principles to present the theory & operation of simple circuit devices & antennas at microwave frequencies, which are the part of modern microwave communication equipment. The emphasis is placed on planar guiding & radiating structures that enable either hybrid &/or monolithic integration of the devices. Modern CAD software packages are introduced & demonstrated through simulations of microwave networks & antenna configurations. This course builds on the fundamental EM field concepts learned in EC 314.			

Module: 38

Code	Course/Module Title	ECTS	Semester
ECE413	Digital Signal Processing	7	7
Class(hr/w)	**Lect/Lab/Prac./Tutor**	**SSWL(hr/w)**	**USWL(hr/w)**
3	1	62	113
Description			
Digital signal processing (DSP) refers to various techniques for improving the accuracy and reliability of digital communications. The theory behind DSP is quite complex. Basically, DSP works by clarifying, or standardizing, the levels or states of a digital signal. The course covers theory and methods for digital signal processing, including basic principles governing the analysis and design of discrete-time systems as signal processing devices. Review of discrete-time linear, time-invariant systems, Fourier transforms and z-transforms. Topics include sampling, impulse response, frequency response, finite and infinite impulse response systems, linear phase systems, digital filter design, and implementation, discrete-time Fourier transforms, discrete Fourier transform and the fast Fourier transform algorithms.			

Module 39

Code	Course/Module Title	ECTS	Semester
ECE414	digital systems Design	6	7
Class(hr/w)	**Lect/Lab/Prac./Tutor**	**SSWL(hr/w)**	**USWL(hr/w)**
3	0	47	103
Description			
This module looks at the methodology of designing and implementing large digital systems. Students taking this module will learn how to design reliable digital systems using synchronous design techniques, will learn how to design digital systems which are easily testable and will be able to use a range of software tools to synthesize digital systems. This course deals with principles of complex digital system design by means of development environments, which allow design automation based on hardware description languages. The different modeling levels and approaches to digital system design are considered based on complex digital components. The course enables the students to understand basic concepts of complex digital system design based on development environments, which allow design automation by means of hardware description languages. The term digital system refers to elements such as hardware, software and networks and their use. There may be many different components that make up one system; for example, a computer has a central processing unit, a hard disk, keyboard, mouse, screen etc. A peripheral device is a digital component that can be connected to a digital system, for example, a digital camera or printer.			

Module: 40

Code	Course/Module Title	ECTS	Semester
ECE415	Computer Communications and Networks	6	7
Class(hr/w)	**Lect/Lab/Prac./Tutor**	**SSWL(hr/w)**	**USWL(hr/w)**
2	2	62	88
Description			
This course focuses on fundamental concepts, principles, and techniques in Computer Communications and Networks. The course will introduce basic networking concepts, including the protocol, network architecture, reference models, layering, service, interface, multiplexing, switching, and standards. An overview of digital communication from the perspective of computer networking will also be provided. Topics covered in this course include Internet (TCP/IP) architecture and protocols, network applications, congestion/flow/error control, routing and internetworking, data link protocols, error detection and correction, channel allocation and multiple access protocols, communication media and selected topics in wireless and data centre networks. It will cover recent advances in network control and management architectures by introducing the concepts of software-defined networking (SDN) and network (function) virtualization. Students taking this course will gain hands-on experience in network programming using the socket API; network traffic/protocol analysis; and assessment of alternative networked systems and architectures.			

Module: 41

Code	Course/Module Title	ECTS	Semester
UNI416	Ethics	2	7
Class(hr/w)	**Lect/Lab/Prac./Tutor**	**SSWL(hr/w)**	**USWL(hr/w)**
2		31	19
Description			
Engineering ethics are principles and guidelines engineers follow to ensure their decision-making is aligned with their obligations to the public, their clients, and the industry. They are the set of rules and guidelines that engineers adhere to as a moral obligation to their profession and to the world. Engineering is a professional career that impacts lives. When ethics are not followed, disaster often occurs; these disasters not only include huge monetary costs and environmental impacts but also often result in the loss of human life. Engineering Ethics applies to every engineer and is very important. This course concentrates on learning students the Following Principles: Honesty and integrity, fairness, honesty, integrity, Respect for life, law, the environment, and public good, Accuracy, rigor, Leadership and communication.			

Module 43

Code	Course/Module Title	ECTS	Semester
ECE422	**VLSI Technology**	6	8
Class(hr/w)	**Lect/Lab/Prac./Tutor**	**SSWL(hr/w)**	**USWL(hr/w)**
3	0	47	103
Description			
This courses of very large-scale integration is a process of embedding or integrating hundreds of thousands of transistors onto a singular silicon semiconductor microchip. VLSI technology's conception started when advanced level processor (computer) microchips were also in their development stages. Two of the most common VLSI devices are the microprocessor and the microcontroller. Typically, electronic circuits incorporate a CPU, RAM, ROM, and other peripherals on a single PCBA. However, very large-scale integration (VLSI) technology affords an IC designer the ability to add all of these into one chip. If we examine the electronics landscape over the last few decades, we will see evidence of its rapid growth. The benefits include increased functionality, improved miniaturization, and increased overall performance. However, this demand to place more components while increasingly utilizing less space translates into a lower margin for error. The remarkable growth of the electronics industry is primarily due to the advances in large-scale integration technologies. With the arrival of VLSI designs, the number of possibilities for ICs in control applications, telecommunications, high-performance computing, and consumer electronics as a whole continues to rise. Presently, technologies like smartphones and cellular communications afford unprecedented portability, processing capabilities, and application access due to VLSI technology. The forecast for this trend indicates a rapid increase as demands continue to increase.			

Module 44

Code	Course/Module Title	ECTS	Semester
ECE423	Satellite communication	7	8
Class(hr/w)	**Lect/Lab/Prac./Tutor**	**SSWL(hr/w)**	**USWL(hr/w)**
3	1	62	113
Description			
This course covers fundamentals of satellites, including applications, orbits, propagation and link calculations, system hardware for space and ground segments, multiplexing and multiple access techniques, network design and future trends. Furthermore, it provides students with fundamentals of signals and noise associated with satellite communications, as well as transmission concepts, including analogue transmission rates with respect to distortionless transmission, amplitude and delay distortions with equalisation, nonlinear distortion with companding, and carrier-to-noise ratio; and digital transmission rates with respect to line codes, intersymbol interference, pulse shaping and equalisation, bit energy-to-noise density and error probabilities. This course builds on the fundamental EM field concepts learned in EC 314.			

Module 45

Code	Course/Module Title	ECTS	Semester
ECE424	Wireless and Mobile communication	7	8
Class(hr/w)	**Lect/Lab/Prac./Tutor**	**SSWL(hr/w)**	**USWL(hr/w)**
3	1	62	113
Description			
Wireless communication networks offer transmission of signals, such as voice, data, and multimedia, without using wires, which is the crucial part of mobile communications. After successful deployment of wireless cellular networks in licensed bands and Wi-Fi networks in unlicensed bands, such as Industry, Scientific, and Medical (ISM) and Unlicensed National Information Infrastructure (UNII), over the last decade, several wireless networks, application, and services are emerging. Furthermore, wireless networks offer several advantages including mobility while getting service, scalability for further extension, reduced cost-of-ownership, and so on. However, there are some disadvantages and concerns, such as security, data rate, reliability, range, etc. The demand of ubiquitous communications is driving the development of wireless and mobile networks. Wireless communication is the fastest growing segment of the communication industry. Overall, in a very wireless communication organization, data transferred from sender to receiver is placed in a restricted place. With the assistance of Wireless Communication, the sender and receiver may be placed anywhere between a couple of meters such as a Television Remote Control to a couple of thousand kilometers such as Satellite Communication.			

Module 46

Code	Course/Module Title	ECTS	Semester
ECE425	Optical communication	7	8
Class(hr/w)	**Lect/Lab/Prac./Tutor**	**SSWL(hr/w)**	**USWL(hr/w)**
3	0	47	128
Description			
Electromagnetic theory of guided waves: Maxwell's equations, ray optics, wave optics. Optical fibers: mode analysis, solutions for step-index fiber, dispersion and losses, graded-index fiber, single-mode fiber, fiber manufacture, cables and components, connectors, joints and couplers, fiber transducers. Optical sources: laser principles, semiconductor junction lasers, light emitting diodes, fiber interface, couplings, laser safety. Detectors: avalanche photo-diode, pin photo-diode. Electro-optic devices and Integrated optics. Fiber communications: digital transmission requirements, pulse dispersion, fiber bandwidth, rise-times, optical transmitters, regenerators, system losses, rise-time calculations, performance standards, design of digital fiber systems. This course builds on the fundamental EM field concepts learned in EC 314.			

3. Contact

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