University of Mosul
جامعة الموصل

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

بكالوريوس - هندسة ميكاترونكس

Table of Contents

1. Overview

This catalogue is about the courses (modules) given by the program of Mechatronics 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.

2. Undergraduate Courses 2025-2026

Module 1

Code	Course/Module Title	ECTS	Semester
UOM 1021	English Language1	2	One
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USSWL (hr/w)**
2		33	17
Description			
In this course, it is aimed at developing students' general English skills through the skills of reading, writing, listening, and speaking. Each This introductory module is meticulously designed to foster the development of first-year undergraduates' general English proficiency, encompassing the core linguistic skills of reading, writing, listening, and speaking. Structured around a series of dynamic units, the course systematically builds upon students' vocabulary and grammatical understanding via engaging reading materials. Each unit integrates interactive activities and practical exercises that encourage the application of language skills in authentic contexts. Students will not only learn to construct fundamental sentence structures but will also engage in dialogues and situational role-plays that mirror real-world scenarios. Incorporating a blend of individual assignments and collaborative projects, the module assesses students' progress through a variety of methods including quizzes, written essays, oral presentations, and listening comprehension tests. Instructional feedback is tailored to reinforce language acquisition and fluency. By the culmination of the module, students will have the confidence and ability to compose coherent sentences and partake in basic conversations pertinent to daily life. The course paves the way for advanced linguistic competencies, setting a solid foundation for subsequent English language studies.unit is organized to enhance students' basic knowledge of vocabulary and grammar through reading texts. The students will learn how to form simple sentences and use			

them in real life situations. By the end of the course, students will be able to produce basic sentences and communicate in simple real-life situations.

Module 2

Code	Course/Module Title	ECTS	Semester
MTE 102	Mathematics I	6	One
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USSWL (hr/w)**
4		63	87
Description			
Students are expected to use their mathematical knowledge and practices to solve problems. This course strengthens students' understanding of functions in preparation for the process of differentiation. Topics in this course are functions, coordinates and graphing, range and domain, exponential and logarithmic functions, trigonometric functions, limits and continuity, derivatives, chain rule, implicit differentiation, linear approximations, applications of derivatives to optimization problems and related rate problems, maxima and minima, matrix and matrix inverse, solution methods for systems of algebraic linear equations, ill/well and singular system, pivoting. Emphasis is placed on the exploration of real-world differential applications.			

Module 3

Code	Course/Module Title	ECTS	Semester
MTE 103	Phisics I	6	One
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USSWL (hr/w)**
2	2	63	87
Description			
This course is considered a basic course for material science as much as it related to a later course entitled manufacturing processes. Mechanical and physical properties and the basic tests are given in an advance. The fundamental tests such as tensile test, compression test, hardness test and impact test, are all given extensively due to their importance to the subject. A brief but basic presentation is given about the most important materials that could be encountered during the engineers s' career. Steels are at the top of those material and their alloys. Afterward, copper and its alloys and aluminum and its alloys are also given in this course. In addition, titanium is given at the end of this introductory course.			

Module 4

Code	Course/Module Title	ECTS	Semester
MTE 104	Engineering Drawing & AutoCAD	5	One

Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USSWL (hr/w)
	4	63	62
Description			
The Engineering Drawing module introduces undergraduate students to the essential concepts and skills of engineering drawing. It covers the identification and usage of engineering tools, including different types of pens for drawing geometric shapes. Students learn about billboard layout, address field numbers, and the properties of various lines used in engineering drawing. The module explores engineering shapes, arcs, lamina, and dimensions, as well as essential engineering operations like dividing lines and angles, and drawing arcs tangent to other elements. An introduction to AutoCAD is provided, focusing on the user interface, coordinate strategies, and draw and modify commands. The module emphasizes hands-on learning and practical application to develop students' proficiency in both traditional and computer-aided design drawing techniques. By the end of the module, students will have a solid foundation in engineering drawing, enabling them to create accurate technical drawings using appropriate tools and software.			

Module 5

Code	Course/Module Title	ECTS	Semester
UOM 1031	Computer1	3	One
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USSWL (hr/w)**
1	2	48	27
Description			
The computer module for undergraduate level provides students with a comprehensive understanding of computer software and hardware, focusing on essential applications such as Microsoft Office Word, PowerPoint, and Excel. This module aims to equip students with the necessary skills and knowledge to effectively utilize these tools for report and document preparation, designing professional presentations and lecture slides, as well as analyzing data using charts, graphs, and various functions in Excel.			

Module 6

Code	Course/Module Title	ECTS	Semester
MTE 106	Electrical Circuits Analysis I	6	One
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USSWL (hr/w)**
2	3	78	72
Description			
This course is a fundamental part of the Mechatronics Engineering curriculum, focusing on analyzing direct current (DC) electrical circuits. It covers the principles of Kirchhoff's laws, series and parallel circuits, conversion of delta to star configurations, nodal and mesh analysis methods, superposition, Thevenin's and Norton's theorems, and the maximum power transfer theorem. Students engage in hands-on activities, lab experiments, and problem-solving exercises to solidify their understanding. By the course's end, students develop a strong foundation in DC circuit analysis, ready to apply their knowledge			

to practical engineering challenges and advance their understanding in Electrical Circuits Analysis II.

Module 7

Code	Course/Module Title	ECTS	Semester
UOM 1040	Democracy and Human Rights	2	One
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USSWL (hr/w)**
2		33	17
Description			
The material includes the fundamentals of defining rights and the types of human rights, as well as guarantees for human rights at both the national and international levels. It also covers the basics of democracy and its various forms, the Islamic perspective on democracy, and the different models of democratic systems. The aim is to help students understand and exercise their democratic rights in society, as well as to enable them to acquire knowledge about their fundamental rights as individuals who have the right to live with dignity, freedom, and equality among students in the stage.			

Module 8

Code	Course/Module Title	ECTS	Semester
UOM 1011	Arabic Language	2	Two
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USSWL (hr/w)**
2		33	17
Description			
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Module 9

Code	Course/Module Title	ECTS	Semester
MTE 109	Mathematics II	5	Two
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USSWL (hr/w)**
4		63	62
Description			
Integral Calculus: Techniques of Indefinite Integration; Definite Integrals; Properties of Definite Integrals; Solids of Revolution; Volume of Cylindrical Shell & Cross Section; Arc Length; Areas of Surfaces of Revolution; Center of Mass; Integration of Transcendental Functions; The Logarithm Defined as an Integral, Exponential Change and Separable Differential Equations, Hyperbolic Functions, Indeterminate Forms and L' Hopital Rule; Trigonometric Integrals; Using Basic Integration Formulas, Integration by Parts, Trigonometric Integrals, Trigonometric Substitutions, Integrals of Rational			

Functions by Partial Fractions, Integral Tables and Computer Algebra Systems; Improper Integrals. Polar Coordinates, Parametrizations of Plane Curves, Calculus with Parametric Curves, Graphing Polar Coordinate Equations, Polar Coordinates, Graphing Polar Coordinate Equations, Areas and Lengths in Polar Coordinates

Module 10

Code	Course/Module Title	ECTS	Semester
MTE 110	Engineering Mechanics-Statics I	5	Two
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USSWL (hr/w)**
3	2	78	47
Description			
This course is an introduction to engineering mechanics. The primary objective of the course is to develop a basic understanding of practical applications and the skills necessary to apply practical problems to solve mathematical problems in the design and implementation of engineering works. This course analyzes basic techniques for efficient numerical problem solving in science and engineering. The course deals with the topics of force analysis and finding the resultant, the concepts of moments, equilibrium, friction between surfaces, truncated projects and structures, finding the internal forces of the ribs, centers of area, length and gravity of geometric shapes, and the moment of inertia of the areas.			

Module 11

Code	Course/Module Title	ECTS	Semester
MTE 111	Computer Programming	5	Two
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USSWL (hr/w)**
2	2	63	62
Description			
The course is designed to teach students the fundamental concepts of computer programming and algorithm development, with a focus on problem-solving techniques and critical thinking. The course will cover a wide range of topics, including introduction to computer programming, Students will learn about the basics of computer programming, including programming languages, syntax, and program structure. as well as data types and control structures, Students will learn about the different data types used in programming, such as integers, floats, and strings. They will also learn about control structures such as if statements, loops, and functions. and algorithm development, Students will learn how to develop algorithms to solve problems, including understanding problem specifications, developing step-by-step solutions, and implementing algorithms in code. and debugging and testing, Students will learn about the process of debugging and testing programs, including identifying and fixing errors and using testing frameworks.			

Module 12

Code	Course/Module Title	ECTS	Semester

MTE 112	Manufacturing Processes	4	Two
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USSWL (hr/w)**
2	2	63	37
Description			
This course is considered an introduction to manufacturing processes and its related topics. Mechanical properties and the basic tests are given in advance in a previous course entitled “material science.” Most of the course is intensified on the machining processes, such as turning operations and their related operations, such as facing, longitudinal machining, tapering, teeth turning … etc. In addition, milling operations and their basic related operation such as facing, slotting, drilling, pocketing, gear milling, are also given. Drilling operations are basically given in this course. A brief introduction about nontraditional machining is also given to the students. Finally, CNC machining and its industrial language, gcode, is given briefly as a preparing step for next levels of studies.			

Module 13

Code	Course/Module Title	ECTS	Semester
MTE 113	Electrical Circuits Analysis II	5	Two
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USSWL (hr/w)**
2	3	78	47
Description			
Expanding on the principles covered in Electrical Circuits Analysis I, this course focuses on the analysis of electrical circuits operating with alternating current (AC). Students delve into the characteristics of AC circuits, including sinusoidal waveforms, phasors, and complex impedance. The course covers topics such as impedance calculations, AC circuit analysis using nodal and mesh methods, AC power analysis, resonance in RLC circuits, filters, and the frequency response of circuits. The concepts of Thevenin's and Norton's theorems are extended to AC circuits, enabling students to simplify complex networks. Additionally, students will learn about network theorems specific to AC circuits, including maximum power transfer and the reciprocity theorem. Practical application is emphasized through hands-on experiments, simulation tools, and problem-solving exercises. By the end of the course, students will have a comprehensive understanding of AC circuit analysis, equipping them with the skills to analyze and design circuits for various applications in mechatronics and electrical engineering.			

Module 14

Code	Course/Module Title	ECTS	Semester
MTE 114	Physics II	4	Two
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USSWL (hr/w)**
2	1	48	52
Description			
This foundational module is tailored to acquaint the students with the essential aspects of Physics. The			

curriculum is designed to impart a solid understanding of measurement units, the variety and functionality of capacitors and inductors, the principles of magnetism, and the overarching laws that govern electromagnetic phenomena. By the end of the course, students are expected to have honed their ability to identify and analyze different materials for their suitability in electrical circuits and applications, with a particular focus on energy storage and resonance phenomena. The teaching strategy encompasses interactive lectures that underscore the theoretical underpinnings of engineering physics and facilitate the practical application of these theories, alongside assignments that encourage research, analysis, and presentation of concepts related to electromagnetic principles.

Module 15

Code	Course/Module Title	ECTS	Semester
UOM 2050	Crimes of the Baath regime in Iraq	2	Three
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USSWL (hr/w)**
2		33	17
Description			
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Module 16

Code	Course/Module Title	ECTS	Semester
MTE 202	Engineering Mechanics-Dynamics	5	Three
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USSWL (hr/w)**
4	1	78	47
Description			
This module teaches students the basic laws and principles of plane kinematics and kinetics of particle and rigid body. It is also concerned with analyses and comprehend free undamped and damped vibrations. Topics covered in the part of particle kinematics include rectilinear motion, curvilinear rectangular Coordinates, application to projectile motion, curvilinear Motion: Tangent-Normal (t-n) coordinates, Cylindrical (r-θ) coordinates, and relative motion. Topics covered in the part of particle kinetics include Newton's Second Law: Force, Mass and Acceleration, rectangular motion, Tangent-Normal (t-n), Cylindrical (r-θ), Work and Energy for a System of Particles, Impulse and Momentum. Topics covered in the part on rigid body motion kinematics include fixed axis rotation, relative velocity, relative acceleration, mass moment of inertia. Topics covered in the part on vibration include undamped free vibrations, damped free vibrations, forced damped vibrations.			

Module 17

Code	Course/Module Title	ECTS	Semester

MTE 203	Applied Mathematics I	6	Three
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USSWL (hr/w)**
4	1	78	72
Description			
This course gives the students some advanced mathematical subjects required in engineering analysis. These subjects are multivariable functions, theore geometrical representation, various partial derivatives methods, and locating critical points of the surface of the multivariable function. After that, Complex analysis is introduced by studying its some definitions, polar coordinates representation of complex variables, and complex algebra. The complex function is terminology is introduced together with the important classification of these functions according to be analytic, and harmonic. Several geometric complex functions are considered. Fourier series is considered with introduction of even, odd, and periodic function. Half range is also considered. Complex Fourier series is the last topic included within Fourier series. Then, Fourier Transforms, are presented. This course is ended with introducing students to vector terminology and vector algebra.			

Module 18

Code	**Course/Module Title**	**ECTS**	**Semester**
MTE 204	Electronic Principles and Devices	6	Three
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USSWL (hr/w)**
4	2	93	57
Description			
This module gives the opportunity for the students to understand the principles of semiconductor electronic devices mainly diodes and transistors, as well as provide them with main characteristics and configurations of such devices to be exploited in various applications. Topic covered in the part of semiconductor diodes contains: n-type and p-type materials, P-N junctions, diodes under biasing conditions, Zener diode, and diode use in real life applications. The part of Bipolar Junction Transistor (BJT) includes: BJT construction and operation, wide range of BJT configurations, BJT as a switch, BJT stability, BJT AC modelling, the re-model of BJT, cascaded systems. The part of Field Effect Transistor (FET) focuses on the operation of Depletion-type and Enhancement-type MOSFETs and the use of such devices in many circuit configurations. The last part concerns with Operational-Amplifier (Op-Amp) that includes its operation and different circuit connections such as single ended input Op-Amp, double ended input Op-Amp, double ended output Op-Amp. Finally, the use of OP-AMP in practical applications are explained. Together with the lecturer, the students are going to explore the principles and theories that explain how electronic devices function, as well as to derive the key equations applicable to amplifier circuits. Ultimately, the goal is to make the students be able to design transistor and diode circuits with a solid understanding of how to choose the necessary components based on real-world applications.			

Module 19

Code	**Course/Module Title**	**ECTS**	**Semester**

MTE 205	Electrical Machines	4	Three
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USSWL (hr/w)**
2	2	63	37
Description			
This course equips students with information related to electrical machines, where the definition begins with the basics of energy conversion from mechanical to electrical form and vice versa. Then the chapter also deals with introducing the types of electrical machines that use direct current and others that use alternating current. The student also gets acquainted with the basic principles of the work of motors and the general equations that analyze their performance, as well as identifying their properties and methods use to control it. The chapter also includes information dealing with the types of special motors such as the servo and the stepper motor, as well as dealing with single-phase electrical transformers			

Module 20

Code	Course/Module Title	ECTS	Semester
MTE 206	Thermodynamics	3	Three
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USSWL (hr/w)**
3		48	27
Description			
Basic concepts and definitions of thermodynamics, thermodynamics and energy, importance of dimensions and units. Properties of pure substances, system and control systems and control volumes, properties of a system, density and specific gravity, state and equilibrium, processes and cycles, temperature and the zeroth law of thermodynamics, pressure, the manometer, the barometer and atmospheric pressure. Energy, energy transfer, and general energy analysis, introduction, forms of energy, energy transfer by heat, energy transfer by work, mechanical form of work, The first law of thermodynamics for the closed and open systems. The second law of thermodynamics. Entropy. Second-Law analysis of engineering systems. Brayton cycle (gas power cycle). Rankine cycle (steam power cycle). Refrigeration cycles.			

Module 21

Code	Course/Module Title	ECTS	Semester
UOM 2022	English Language 2	2	Three
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USSWL (hr/w)**
2		33	17
Description			
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Module 22

Code	Course/Module Title	ECTS	Semester
MTE 207	Experimental Methods for Engineers	2	Three
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USSWL (hr/w)**
2		33	17
Description			
Introduction and Basic Concepts (Definition of Terms, Calibration, Standards, Dimensions and Units, The Generalized Measurement System, Basic Concepts in Dynamic Measurements, System Response, Distortion, Impedance Matching, Fourier Analysis, Experiment Planning), Analysis of Experimental Data, Basic Electrical Measurements and Sensing Devices, Displacement and Area Measurements, Flow– pessure – d temperature Measurement			

Module 23

Code	Course/Module Title	ECTS	Semester
MTE 208	Applied Mathematics II	6	Four
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USSWL (hr/w)**
4	2	93	57
Description			
This course gives the students the ability to solve and investigate the differential equations using different methods, most types of ordinary differential equations will be covered (1st order and second order, linear and non- linear). In doing so, the students will gain an advantage for the next courses in that some signal processing and control system problems that will be easier to solve. Also, the Laplace transform method is used to solve the differential equations, and more information about this transform can be gained and investigated. This is to serve in several other classes of system control. The last topic to be considered is the vector function and vector calculus; within this, the students will study geometrical meanings of various vector functions, evaluate and interpret various derivatives of vector fields like gradient, divergence, and curl.			

Module 24

Code	Course/Module Title	ECTS	Semester
MTE 209	Fluid Mechanics	4	Four
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USSWL (hr/w)**
4		63	37
Description			
This class provides students with an introduction to principal concepts and fluid properties in addition to the methods of fluid mechanics. Topics covered in the part of the fluid statics include pressure; pressure measurements; pressure distribution and center of pressure; and hydrostatics force. Topics covered in the part on fluid dynamics include open systems and control volume analysis; flow classification; mass conservation; and Bernoulli Equation conservation for moving fluids; viscous fluid flows. Topics covered in the part on fluid dynamics include momentum conservation for moving fluids; Dimensional analysis, similitude, and modeling; Viscous flow in pipe. Students will work to formulate the models necessary to study, analyze, and design fluid systems through the application of these concepts, and to develop the problem-solving skills essential to good engineering practice of fluid mechanics in practical applications.			

Module 25

Code	Course/Module Title	ECTS	Semester
MTE 210	Mechanics of Materials	4	Four
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USSWL (hr/w)**
2	2	63	37
Description			
This course gives students the main tools for the mechanical properties of materials by finding the effect of internal loads on a member and analyzing related stresses and strains, to find the state of stresses. In addition, students will discover the types of stresses that happen in machines under different types of loads. The students who successfully fulfill the course requirements will be able to relate the effect of internal loads on a solid object to the strength of its material. Gain knowledge about the different types of stresses and deformations related to these loads. Gain the ability to use the principles of this subject for the use of the formulas and rules of mechanical design cited in engineering codes.			

Module 26

Code	Course/Module Title	ECTS	Semester
MTE 211	Digital Logic Design	4	Four
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USSWL (hr/w)**
2	2	63	37
Description			
Foundation in design and analysis of Numerical Systems and the operations of digital gates. Design and implementation of combinational and sequential logic circuits. Concepts of Boolean algebra, Karnaugh maps, Adders circuits, flip-flops, registers, and counters along with various logic families and comparison of their behavior and characteristics.			

Module 27

Code	Course/Module Title	ECTS	Semester
MTE 212	Statistics	5	Four
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USSWL (hr/w)**
3	1	63	62
Description			
The need of engineering economy and Statistics is primarily motivated by the fact that everything in engineering has to be carried out economically and statically. Topics concepts of Extinction, Interest, Alternatives, Economic Feasibility, Time Value of Money, production costs, economic feasibility, sensitivity analysis, Break- Even Point, General introduction of Engineering Statistics, Data Presentation, Tabular presentation /Creating Frequency Table, Graphical presentation (Histogram, Frequency			

Polygon), Measures of central tendency (Arithmetic mean, median and mode, the relation between the central tendency measures for unimodal distributions, Measurement of dispersion and variation, absolute dispersions, Probability: Basic Concepts of Probability Theory, Rule of Probability Additional rule Two events, mutually and non-mutually events- Three events, mutually and non-mutually events will be discussed through the class.

Module 28

Code	Course/Module Title	ECTS	Semester
MTE 213	Signals and Systems	3	Four
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USSWL (hr/w)**
2		33	17
Description			
This class provides students with an introduction to the fundamentals of signal and system analysis, each of signals and system types and applications, also, modern digital processing focusing on representations of discrete-time and continuous-time signals (signals representation types, singularity functions, complex exponentials and geometrics, sampling and quantization) and linearity, causuallity, time variant and stability, then representations of linear, time-invariant systems (differential equations, block diagrams, system functions, convolution, correlation and modulation) signal processing and digital signal processing applications			

Module 29

Code	Course/Module Title	ECTS	Semester
UOM 2032	Computer2	3	Four
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USSWL (hr/w)**
1	2	48	27
Description			
• This class provides students with an introduction to python language to learn functions beginners into proficient problem solvers. You will explore the synergy between Python—one of the most versatile programming languages—and algorithmic thinking. By the end of this course, you will write clean, efficient, and scalable code. Design and implement a complex, real-world application (e.g., pathfinding visualizer or data analysis tool) from scratch.			

Module 30

Code	Course/Module Title	ECTS	Semester
UOM 2012	Arabic language2	3	Four
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USSWL (hr/w)**
2		33	17

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Module 31

Code	Course/Module Title	ECTS	Semester
MTE 301	Measurement and Instrumentation	4	Five
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USSWL (hr/w)**
2	2	63	37
Description			
This course covers the experimental techniques for observation and measurement of physical variables such as force, strain, temperature, flow rate, and acceleration. It allows students to learn the principles of transduction, measurement circuitry, MEMS sensors, electrical impedance analysis and measurement principles. The theory of analogue DC and AC measuring instruments is first established which is then used to study analog electronic and digital meters. Topics of this course include basic, classification, characteristics and types of sensors. Basic measurement principles based on resistance, capacitance, light, magnetism etc. The course is a combined lecture and laboratory teaching. Typical laboratory experiments involve oscilloscopes, electronic circuits including operational amplifiers, thermocouples, strain gauges, digital recorders, lasers, etc. The student will design a simple measurement project for a given application, based on different physical measurement principles.			

Module32

Code	Course/Module Title	ECTS	Semester
MTE 302	Control System	6	Five
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USSWL (hr/w)**
3	3	93	57
Description			
This module teaches students the essential knowledge related to control system. Control Systems is the study of the analysis and regulation of the output behaviors of dynamical systems subject to input signals. Also, the module aims at giving the student adequate skills in mathematical modeling, block diagram reduction, time domain analysis (transient and steady state) and control system stability, the essential knowledge related to frequency control system. Also, the course aims at giving the student adequate skills in root locus lead and lag compensators, Bode Plots, and Nyquist Plots. Relative Stability, Gain and Phase Margins. The emphasis of this module will be on the basic theories and feedback controller design methods of linear time-invariant systems.			

Module 33

Code	Course/Module Title	ECTS	Semester

MTE 303	Signal Processing	6	Five
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USSWL (hr/w)**
4	2	93	57
Description			
The goals of this course are to provide students with an understanding of discrete-time signals and the analytical tools to transform, analyze, and design digital signal and image processing systems, including various types of filters. Upon the completion of this course, students will be able to deal with basic digital processing techniques for the mechatronic system, learn Z- and Discrete Fourier transforms and their application, design FIR and IIR digital filters to meet arbitrary specifications, and design and implement digital signal and image processing algorithms for various applications.			

Module 34

Code	**Course/Module Title**	**ECTS**	**Semester**
MTE 304	Microprocessors & Assembly Language	6	Five
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USSWL (hr/w)**
2	4	93	57
Description			
This undergraduate lecture series provides a comprehensive understanding of microprocessors and the intricate art of assembly language programming. Students will trace the evolution of microprocessors, starting from their historical roots and progressing towards contemporary microcomputers, while also learning the essential theories and applications that govern these powerful devices. The course will delve into the internal architecture of microprocessors, particularly focusing on the 8086 and 8088 microprocessors, to give students a firm grounding in this core aspect of computer science. Following this, students will be introduced to the distinct parts of assembly language instruction statements and the overall process of developing assembly language programs.			

Module 35

Code	Course/Module Title	ECTS	Semester
MTE 305	Mechanical Engineering Laboratory	2	Five
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USSWL (hr/w)**
	2	33	17
Description			
This practical course includes providing basic experiences and experimental investigation of phenomena in various topics in mechanical engineering to reinforce concepts presented in the Department's core courses and that have applications in the field of mechatronics engineering. This course will provide essential knowledge of basic laboratory measurement techniques and how to collect experimental results and analyze and interpret the data. Learn how to write technical reports how in the form of engineering reports and executive summaries, and also be trained in group work. This course included pre-arranged experiments related to applied mechanics, mechanical systems, materials, heat transfer, and fluid mechanics.			

Module 36

Code	Course/Module Title	ECTS	Semester
MTE 306	Theory of Machines	6	Five
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USSWL (hr/w)**
3	2	78	72
Description			
This module provides students the foundation for the study of displacements, velocities, accelerations, and static and dynamic forces required for the proper design of mechanical linkages, power transmissions, and geared systems. Topics covered in the part of mechanism kinematics include position analysis for different mechanisms, velocity analysis which are Instantaneous method center and relative velocity method, acceleration analysis to calculation of linear and angular accelerations for points on mechanisms. Topics covered in the part on machine dynamics include calculation of efficiency and power transmission, static and dynamic balancing of rotating and reciprocating masses, turning moment diagram, and theoretical derivation and applications of Gyroscope. Topics covered in the part on power transmissions include flat belt and V-belt, flat and cone clutches, definitions and low of gearing, length of arc of contact, minimum number of teeth, simple and compound gear trains, Epicyclic gear train.			

Module 37

Code	Course/Module Title	ECTS	Semester
MTE 307	Heat Transfer	5	Six
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USSWL (hr/w)**
3	1	63	62
Description			
Introduction to heat transfer and its relationship to thermodynamics (first and second law of thermodynamics), One-dimensional, steady-state conduction with and without heat generation, The plane wall, temperature distribution, thermal resistance, contact resistance, porous media, radial systems (cylinder and sphere) and extended surfaces (Fins), a general conduction analysis, fins of uniform cross-sectional area, fin performance, fins of nonuniform cross-sectional area, overall surface efficiency. Two-dimensional, steady-state conduction (separation of variables, shape factors, and finite difference methods), introduction to convection (laminar and turbulent boundary layer equation, dimensionless parameters, Reynolds analogy), radiation, physics of thermal radiation, black body heat exchange, classification of heat exchangers in mechatronics systems, design of heat exchangers.			

Module 38

Code	Course/Module Title	ECTS	Semester
MTE 308	Hydraulic & Pneumatic Systems	5	Six
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USSWL (hr/w)**
2	2	63	62
Description			
The course is intended to introduce students to the hydraulic and pneumatic systems; their principles of operation and applications of basic industrial processes. The components in the power generation, control, and drive sections are discussed in various levels with more focus on the control section. Component functions, construction, and usage. The control section using fluid power, electric power, and PLC is used throughout the example circuits. During the progress in the course, with various industrial circuits are discussed, with focus on fluid pressure and flow rate to control the output work at the actuators. The course ends with the types of actuators and their special uses and a how to calculate actuator efficiency.			

Module 39

Code	Course/Module Title	ECTS	Semester
MTE 309	Computer Aided Machine Design I	5	Six
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USSWL (hr/w)**
2	2	63	62
Description			

This course is considered a basic but important introductory to the mechanical design of machine elements that is considered a main core of the student curriculum. Starting from the basic stress analysis, combined stress analysis, the graphical but powerful method for estimating the stress at any direction of the point of interest using Mohr's circle. Shaft design, which is found widely in machines, is given extensively to the students. Column design is also given in a fair manner. This course is coupled well with a powerful software analysis which is given side by side after each theoretical core in the lab. At the end of the course, students will have a basic knowledge about the most important component of any mechanical device such as shafts, bearings, ball bearings, fasteners, bolts, couplings, keys, springs …. etc.

Module 40

Code	Course/Module Title	ECTS	Semester
MTE 310	Microcontroller System Design	5	Six
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USSWL (hr/w)**
2	2	63	62
Description			
This practical, lab-based course equips students with the essential principles of microcontroller programming and architecture, using the powerful and versatile 8-bit PIC16F84A microcontroller, renowned for its comprehensive features and user-friendly operation. The course commences with a thorough exploration of the PIC16F84A microcontroller, familiarizing students with its architecture, functional components, and programming paradigm. Students will then be introduced to both C and assembly programming languages, alongside the official software for PIC microcontroller development, the MPLAB IDE. Additionally, students will be guided on the usage of simulation environments, namely MikroC Pro for PIC and Proteus, and carry out several experimental simulations to solidify their understanding and skills.			

Module 41

Code	Course/Module Title	ECTS	Semester
MTE 311	Numerical Methods	5	Six
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USSWL (hr/w)**
3	1	63	62
Description			
This course is an introduction to numerical analysis. The primary objective of the course is to develop a basic understanding of numerical algorithms and skills to implement algorithms to solve mathematical problems on the computer. This course analyzed the basic techniques for the efficient numerical solution of problems in science and engineering. Topics concepts and role for the numerical method in engineering, approximations and errors, numerical solution of Nonlinear algebraic equations, regression, interpolation, approximation of functions, numerical differentiation, numerical integration, direct and indirect (iterative) methods in linear algebraic equations, and numerical solution of ordinary differential equations (initial and boundary value problem).			

Module 42

Code	Course/Module Title	ECTS	Semester
MTE 312	Power Electronics and Drive	5	Six
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USSWL (hr/w)**
2	2	63	62
Description			
This module introduces the definition of power electronics science and its relation with the other science, the second part presents the power electronic switches or devices that build the different types of power, electronics converters method of triggering circuit for Thyristor, snubber circuit. The next parts related to power conversion circuit that classify into four parts (AC to DC converter or rectifiers with different types of load, AC to AC converters or AC voltage controller, DC to DC converters or Chopper and DC to AC converters or inverters), the last part deals with PWM techniques and switch mode power supply.			

Module 43

Code	Course/Module Title	ECTS	Semester
MTE 401	Modern Control Systems	6	Seven
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USSWL (hr/w)**
2	4	93	57
Description			
This module addresses how to control complex dynamic systems using modern state-space techniques. This involves time domain descriptions of dynamic systems using state-space system models. The characteristics responsible for the dynamic response (poles, zeros, eigenvalues) are presented. Control laws using state-space methods are introduced, including specification of controller characteristics, pole placement, and optimal (LQR) control. The implementation of control in digital systems is also covered. The learning objectives of the course are achieved using various assessments, including weekly laboratories in which students design control systems for a series of experimental apparatus.			

Module 44

Code	Course/Module Title	ECTS	Semester
MTE 402	Industrial Automation	5	Seven
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USSWL (hr/w)**
2	2	63	62
Description			
In the "Industrial Automation" course, students will gain a comprehensive understanding of automation systems in industrial settings. They will explore the benefits of automation across industries, distinguish it from information technology, and discover its pivotal role in production systems. The course covers the architecture of automation systems, including sensing and actuation components, along with essential			

knowledge of industrial sensors, actuators, control systems, and measurement characteristics. Students will also develop programming skills for programmable logic controllers (PLCs) and learn formal modeling techniques for effective sequence control design. By the course's end, students will be well-equipped to succeed in the dynamic field of industrial automation.

Module 45

Code	Course/Module Title	ECTS	Semester
MTE 403	Robotics	6	Seven
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USSWL (hr/w)**
2	4	93	57
Description			
This module teaches students the basic laws and principles in the field of robotics. It covers the fundamentals of kinematics, dynamics, trajectory planning, control of robot manipulators, and mobile robot kinematics and navigation. Topics covered in the part of robot kinematics include Link-connection description, derivation of link homogeneous transformations, forward and inverse kinematics of robotic manipulators. Topics covered in the part of dynamics of manipulators include, differential kinematic equations, the manipulator Jacobian, force relations, Iterative Newton-Euler dynamic formulation, and trajectory generation. Topics covered in the part of robot manipulator's motion control include feedback and closed-loop control, second-order linear system, control-law portioning, trajectory-following control, computed torque method. Topics covered in the part of robot mobile robot include forward and inverse kinematics, path planning algorithms based on A-star, Dijkstra, probabilistic roadmaps (PRM), and rapidly exploring random trees (RRT). Laboratory experiments were prepared.			

Module46

Code	Course/Module Title	ECTS	Semester
MTE 404	Computer Interface	5	Seven
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USSWL (hr/w)**
2	3	78	47
Description			
The course "Computer Interface" is designed to offer students a thorough understanding of computer interfaces and data acquisition on PCs. Throughout the course, students will delve into a range of topics, including analog signal transmission, signal conditioning techniques, analog-to-digital and digital-to-analog conversion, microprocessor addressing systems, and different types of computer ports such as parallel, serial, and game ports. By the end of the course, students will possess the necessary knowledge and practical skills to effectively design and program computer interfaces for diverse applications. Additionally, they will have gained a solid foundation in data acquisition methods on PCs, empowering them to tackle real-world interface challenges with confidence.			

Module 47

Code	Course/Module Title	ECTS	Semester
MTE 405	Artificial Intelligence	4	Seven
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USSWL (hr/w)**
4	1	78	22
Description			
To describe the role of intelligence in Mechatronics analytically. The description is achieved using a survey of the constituents of computationally intelligent approaches, and the applications in Mechatronics are exemplified to let the students be aware of radically different tools from the conventional ones, to describe when/how and why we need intelligence and how we implement it.			

Module 48

Code	Course/Module Title	ECTS	Semester
MTE 406	Capstone Team Project I	4	Seven
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USSWL (hr/w)**
	3	48	52
Description			
This course is an introduction to engineering project. The primary objective of the course is to develop a basic understanding of practical applications and the skills necessary to apply practical problems to solve mathematical problems in the design and implementation of engineering works. This course analyzes basic techniques for efficient numerical problem solving in science and engineering.			

Module 49

Code	Course/Module Title	ECTS	Semester
MTE 407	Computer Aided Machine Design II	7	Eight
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USSWL (hr/w)**
2	3	78	97
Description			
This course is considered an extension to the previous course which entitled “”. It is almost considered a direct application of the knowledge and information given in the previous related courses. During this course, students will study types and behavior and how to select rolling bearing such as the well-known single row deep groove bearing, plain bearing such as Babbitt bearing material, linear motion elements such power screw, ball screw, bolted frames, welded frames, springs, gears such as spur and worm gears, coupling, fasteners such as bolts, rivets, keys. This course is accompanied by a lab work considering using a powerful modeling and analyzing software which available and widely used abroad.			

Module 50

Code	Course/Module Title	ECTS	Semester
MTE 408	Special Topics in Mechatronics	6	Eight
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USSWL (hr/w)**
2		63	87

Description

This course deals with a range of topics related to mechatronics as follow:
Nanotechnology systems and applications typically involve the study and manipulation of materials and devices at the nanoscale level (1 to 100 nanometers).

Embedded systems design and applications involve the development and implementation of computer systems with dedicated functions within larger mechanical or electrical systems. Indicative contents of this topic may include microcontrollers, microprocessors, real-time operating systems,

Electric vehicles (EVs) refer to automobiles that are powered by electric motors instead of internal combustion engine

SCADA (Supervisory Control and Data Acquisition) Systems are used to monitor and control industrial processes and infrastructure

Autotronics Engineering combines automotive technology with electronics, encompassing the design, development, and integration of electronic systems in automobiles

Bio mechatronics is an interdisciplinary field that combines biology, mechanics, electronics, and computer science to develop prosthetics, exoskeletons, and robotic systems that interact with and augment human capabilities

Reconfigurable robots are robotic systems designed to adapt and reconfigure their physical structure or control strategies to perform various tasks or respond to changing environments

Renewable energy refers to energy generated from natural resources that are continually replenished, such as solar power, wind power, hydropower, geothermal energy, and biomass

Module 51

Code	Course/Module Title	ECTS	Semester
MTE 409	Engineering Management	3	Eight
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USSWL (hr/w)**
2		33	42

Description

The Engineering Management module provides students with a comprehensive understanding of effectively managing engineering projects and organizations. It covers topics such as project feasibility, production costs analysis, organization, resource allocation, operations research techniques, quality control, and ethical considerations. Students will develop the necessary knowledge and skills to make informed decisions and optimize various aspects of engineering management. They will learn to assess

project feasibility, analyze production costs, allocate resources efficiently, and solve complex engineering management problems using operations research techniques. The module also emphasizes quality control principles, including comprehensive inspection methods and control charts. By the end, students will be equipped to contribute to the success of engineering projects and organizations while upholding ethical standards and promoting sustainable practices.

Module 52

Code	Course/Module Title	ECTS	Semester
MTE 410	Design of Mechatronics Systems	5	Eight
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USSWL (hr/w)**
2	2	63	62
Description			
This course is offered to provide students with the experience, confidence and competence in the design and implementation process of mechatronics systems. It allows students to integrate knowledge of mechanics, electronics, electrical engineering, measurement systems, programming, and control into designing comprehensive mechatronic systems. Topics of this course include modeling methods of mechatronics system components (mechanical, electrical, electromagnetic, electrotechnical, …etc), sensor selection, electromechanical actuator selection and specification, software and hardware architecture of typical controllers for mechatronics systems. The course is a combined lecture and laboratory teaching. The Labs will require students to use a provided controller kit to finish hardware development assignments. The course includes course-project work that will prepare students for the final year graduation project, by enhancing planning and team work skills as well as the building of prototypes.			

Module 53

Code	Course/Module Title	ECTS	Semester
MTE 411	Computer Aided Manufacturing (CAM)	5	Eight
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USSWL (hr/w)**
2	2	63	62
Description			
This course teaches the basics of computer aided manufacturing. Students will be able to create part drawings, select tooling needed to manufacture the part, and generate the tool paths. They will be able to verify tool paths, post process paths for various controllers and vendors of different brands, and edit the tool path output. This will be done through a series of projects and lab exercises. Basics of CNC, computer numerical control, machines will be given. Typical CNC machines are presented and their important features are categorized. Basics of CNC industrial programming language, gcode, are given during this course which is considered the core of the CNC learning outcome.			

Module 54

Code	Course/Module Title	ECTS	Semester
MTE 412	Capstone Project II	4	Eight
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USSWL (hr/w)**
	3	48	52
Description			
This course enables students to use knowledge acquired during their studies to undertake the second part of their chosen engineering research project. In the process, students will employ hands-on, analytical and computing skills relevant to their fields of studies. The subject involves undertaking a substantial project conducted in a small group (typically 2-3 students) requiring an independent investigation on an approved topic in advanced engineering design or research. Students will present their findings to the scientific committee for final discussion. The following topics will be covered in this course: Identifying risks, identifying potential failures, and developing precautions. Initializing simulations of analytical models, carrying out a project based on models, carry out the necessary work, and Report about conceptual design.			

Contact

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