

الجامعة التقنية الشمالية

Northern Technical University

الكلية التقنية الهندسية الموصل

Technical Engineering College of Mosul

First Cycle – Bachelor's Degree (B.Tech.) in Medical Instrumentation Techniques Engineering

الدورة الاولى - بكالوريوس هندسة تقنيات الأجهزة الطبية

Undergraduate Degree Modules Catalogue

2025-2026

Modules Catalogue Form

University Name: Northern Technical University.....

Faculty/Institute: Technical Engineering College Mosul.....

Scientific Department: Medical Instrumentation Techniques Engineering

Academic or Professional Program Name: Bachelor of Medical Instrumentation Techniques Engineering

Final Certificate Name: Bachelor of Medical Instrumentation Techniques Engineering

Academic System: Bologna Process.....

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Approval of the Dean

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1. Overview

This catalogue describes the courses (modules) offered by the Bachelor of Technology (B.Tech.) in Medical Instrumentation Techniques Engineering programme. The programme includes 48 modules with over 6,000 student workload hours and a total of 240 European Credit Transfer and Accumulation System (ECTS). The delivery of modules based on the Bologna Process.

1. نظره عامه

هذا الدليل يصف المواد الدراسية التي يقدمها برنامج هندسة تقنيات الاجهزة الطبية للحصول على درجة بكالوريوس التقني في هندسة تقنيات الاجهزة الطبية. يتضمن البرنامج 48 مادة دراسية والتي تتمثل باكثر من 6,000 ساعة حمل تكليفي على الطالب و إجمالي ٢٤٠ وحدات أوروبية. يعتمد البرنامج و المواد الدراسية على مسار بولونيا.

2. Undergraduate Courses/ Modules 2025-2026

Level	First	Semester	First	Module	1
Module Code	Module Name in English		ECTS		
MIE101	Direct Current Circuit Analysis		8		
Class (hrs/week)	Lect /Lab. /Prac. /Tutor		SSWL (hrs/week)	USWL (hrs/week)	
4	4		120	80	
Description					
To introduce the student to the D.C. circuits topologies starting from the resistor types and how to read its value, to ohm's law and the circuit analysis theorems and laws. Also, the independent and the dependent sources are given. Node, mesh, Kirchhoff's, Thevenin's and Norton's all defined and used to analyses electrical circuits and networks. The conversion between Delta and Wey is given which is quite necessary when the circuit components cannot be categorized as combinations of series and parallel resistors.					

Level	First	Semester	First	Module	2
Module Code	Module Name in English			ECTS	
MIE102	Physics			8	
Class (hrs/week)	Lect /Lab. /Prac. /Tutor		SSWL (hrs/week)	USWL (hrs/week)	
4	4		120	80	
Description					
• Studying the physical phenomena. • Understanding the basic principles and physical laws. • Understand the basic principles and physical laws related to medicine. • Familiarise students with physical explanations. • Familiarise students with how to conduct physics experiments.					

Level	First	Semester	First	Module	3
Module Code	Module Name in English			ECTS	
MIE103	Mathematics			6	
Class (hrs/week)	Lect /Lab. /Prac. /Tutor		SSWL (hrs/week)	USWL (hrs/week)	
6	0		90	60	
Description					
In this course, students will be introduced to and taught some of the fundamentals of mathematics, including derivatives, integration, matrices, and other related topics. Where these topics can be taught through advanced mathematics and where these mathematical topics are related to the study of some engineering topics that					

are present across each stage of the Department of Medical Instrumentation Techniques Engineering.					
Level	**First**	**Semester**	**First**	**Module**	**4**
Module Code	**Module Name in English**		**ECTS**		
MIE110	**Engineering Drawing**		**4**		
Class (hrs/week)	**Lect /Lab. /Prac. /Tutor**	**SSWL (hrs/week)**	**USWL (hrs/week)**		
0	**4**	**60**	**40**		
Description					
This course is designed to teach AutoCAD, its features, and proper usage. Utilising 2D commands to create 2D illustrations. Developing complex designs and modifying them with modification tools. Adding dimensions and text to 2D drawings as well as modifying their characteristics.					

Level	**First**	**Semester**	**First**	**Module**	**5**
Module Code	**Module Name in English**		**ECTS**		
NTU101	**English Language**		**2**		
Class (hrs/week)	**Lect /Lab. /Prac. /Tutor**	**SSWL (hrs/week)**	**USWL (hrs/week)**		
2	**0**	**30**	**20**		
Description					
This course's objectives are to assess language proficiency levels, establish foundational grammar and vocabulary, improve speaking and writing skills, expand vocabulary, consolidate learning, and evaluate progress. Students' proficiency levels will be determined through diagnostic assessments, allowing for individualized instruction. The course will review and reinforce fundamental grammar concepts and vocabulary while emphasizing the development of speaking and writing skills via a variety of activities. The expansion of vocabulary will be accomplished by introducing					

new words and expressions. Lastly, the course will assess students' progress and proficiency through listening exercises, speaking practice, and a final exam.

Level	First	Semester	First	Module	6
Module Code	Module Name in English		ECTS		
NTU100	Democracy and Human Rights		2		
Class (hrs/week)	Lect /Lab. /Prac. /Tutor		SSWL (hrs/week)	USWL (hrs/week)	
2	0		30	20	
Description					
التعرف على الحقوق المكتسبة لكلّ إنسانٍ على وجه الأرض بلا تحيُّزٍ أو تمييز، وبغض النظر عن عرقه، أو جنسيته، أو جنسه، أو لغته، أو دينه، وبذلك يحِقُّ لكلّ فردٍ في العالم بأن يتمتَّع بالحقوق الخاصة به دون أي مساسٍ بها بما يضمن له العيش بكرامةٍ ومساواة					

Level	First	Semester	Second	Module	7
Module Code	Module Name in English		ECTS		
MIE107	Alternating Current Circuit Analysis		8		
Class (hrs/week)	Lect /Lab. /Prac. /Tutor		SSWL (hrs/week)	USWL (hrs/week)	
4	4		120	80	
Description					
This course will introduce the student to electrical components other than the resistor. Beginning with an understanding of their structure and how they respond to electrical or magnetic fields, then determining their current voltage relationships and time constants. In addition, introduce the principle of Alternating Current (AC) generation, wave characteristics, and the response of components to the sine wave. In such circuits, the power triangle is extremely important and should be considered.					

Also examining three-phase systems with a vast array of applications and balanced and unbalanced loads.

Level	First	Semester	Second	Module	8
Module Code	**Module Name in English**			**ECTS**	
MIE108	**Mechanics**			**4**	
Class (hrs/week)	**Lect /Lab. /Prac. /Tutor**		**SSWL (hrs/week)**	**USWL (hrs/week)**	
4	**0**		**60**	**40**	

Description

Module Objectives for Engineering Mechanics/Statics:

1. **Understand the fundamental concepts and principles of Statics, including motion, forces, and acceleration.**
2. **Apply kinematic equations to analyze the motion of particles and rigid bodies in various scenarios.**
3. **Determine the relationship between forces, mass, and acceleration using Newton's laws of motion.**
4. **Apply the principles of work and energy to analyze and solve dynamic problems.**
5. **Analyze and calculate linear and angular momentum, and apply the principle of impulse and momentum to dynamic systems.**
6. **Understand and apply the principles of vibrations and oscillations in mechanical systems.**
7. **Apply principles of balancing rotating masses and vibrations to ensure smooth operation of machinery.**
8. **Analyze multi-degree of freedom systems and determine their natural frequencies and mode shapes.**
9. **Apply dynamic principles to real-world engineering problems and systems.**
10. **Develop critical thinking and problem-solving skills in the context of engineering Statics.**
11. **Communicate effectively, both orally and in writing, to present and explain the analysis, results, and solutions of dynamic problems.**

By achieving these module objectives, students will gain a comprehensive understanding of the principles and applications of engineering Statics. They will be able to analyze and solve problems related to motion, forces, and vibrations in

mechanical systems, and apply their knowledge to real-world engineering scenarios. They will also develop skills in critical thinking, problem-solving, and effective communication, which are valuable in the field of engineering.

Level	First	Semester	Second	Module	9
Module Code	Module Name in English			ECTS	
MIE109	Medical Physics			7	
Class (hrs/week)	Lect /Lab. /Prac. /Tutor		SSWL (hrs/week)	USWL (hrs/week)	
4	3		105	70	
Description					
• The study of the physical phenomena of the human body and the handling of its associated medical equipment. • Understanding the fundamental principles and physical laws influencing the ope ration and functions of the human organism. • Understand the fundamental physical principles and laws associated with medica l instrumentation. • Introduce students to physical explanations related to the human body's function • Familiarise pupils with how to conduct physics experiments that simulate the hu man body's functioning.					

Level	First	Semester	Second	Module	10
Module Code	Module Name in English			ECTS	
NTU102	Computer			3	
Class (hrs/week)	Lect /Lab. /Prac. /Tutor		SSWL (hrs/week)	USWL (hrs/week)	
1	2		45	30	
Description					
1. Studying computer principles. 2. Defining keyboards and mice.					

3. Presenting principles of memories.
4. Explaining disc drives.
5. Explaining principles of windows.
6. Illustrating accessories of windows.

Level	First	Semester	Second	Module	11
Module Code	Module Name in English			ECTS	
MIE111	Chemistry			6	
Class (hrs/week)	Lect /Lab. /Prac. /Tutor		SSWL (hrs/week)	USWL (hrs/week)	
3	3		90	60	
Description					
The investigation of the connections between chemistry and physics as well as the laws that emerge from those connections. In addition to this, it intends to investigate the numerous forms of matter as well as the techniques of transition from one material to another by taking into account the qualities of each substance. Furthermore, it will investigate the transformation of work into energy as well as the study of the heat that is produced by various chemical reactions.					

Level	First	Semester	Second	Module	12
Module Code	Module Name in English			ECTS	
NTU103	Arabic Language			2	
Class (hrs/week)	Lect /Lab. /Prac. /Tutor		SSWL (hrs/week)	USWL (hrs/week)	
2	0		30	20	

Description
تعليم بأساسيات اللغة العربية، على انه علم يبحث تعليم المهارات اللغوية وتطبيقها في المخاطبات اليومية والرسمية .التعامل على اساس الاقتباس ثم التعلم بهدف تطوير القابلية الذهنية للطالب.تنمية قدرة الطالب على اتقان اللغة وتحليل ظواهر الكلام.تشجيع البحث العلمي وتحسين المهارات النقاشية لدى الطالب.تنمية وتطوير المهارات الابداعية والتفكيرية والقدرة على التحليل والفهم والاستنباط في المجالات اللغوية والأدبية.

Level	Second	Semester	Third	Module	13
Module Code	Module Name in English			ECTS	
MIE201	Medical Laboratory Instrumentation			7	
Class (hrs/week)	Lect /Lab. /Prac. /Tutor		SSWL (hrs/week)	USWL (hrs/week)	
4	3		105	70	

Description

- Understanding the basic principles of instrumentation and measurement techniques used in clinical laboratory settings.
- Familiarizing students with the different types of laboratory equipment used in clinical settings, such as centrifuges, microscopes, spectrophotometers, and chromatographs.
- Developing an understanding of the appropriate use and maintenance of laboratory equipment to ensure accurate and reliable results.
- Understanding the principles of quality control and quality assurance in laboratory testing, including the use of equipment validation and calibration procedures.
- Developing skills in instrument troubleshooting and problem-solving in order to ensure accurate and reliable laboratory results.
- Understanding the importance of safety and regulatory compliance in laboratory settings.

Level	Second	Semester	Third	Module	14
Module Code	Module Name in English			ECTS	
MIE202	Programming Languages			4	
Class (hrs/week)	Lect /Lab. /Prac. /Tutor		SSWL (hrs/week)	USWL (hrs/week)	
1	3		60	40	

Description
• This course introduces students to C++ programming language. • Understanding the effort needed to successfully develop engineering-oriented software. • Introduce fundamental programming concepts • Teach C++ syntax and data types • Explain control structures (such as if-else statements, loops) • Introduce arrays and their usage • Teach functions and their implementation • Provide hands-on practice to develop basic software applications

Level	Second	Semester	Third	Module	15
Module Code	Module Name in English			ECTS	
MIE203	Principles of Electronic Circuits			6	
Class (hrs/week)	Lect /Lab. /Prac. /Tutor		SSWL (hrs/week)	USWL (hrs/week)	
3	3		90	60	
Description					
The objective is to provide a thorough comprehension of diodes and their applications in electronic circuits, materials used in electronic devices, behaviour of semiconductors, operation and characteristics of diodes, various diode models, rectifiers (both half-wave and full-wave), filters and regulators, diode limiters and clampers, diode multiplier circuits, Zener diodes and their characteristics, applications of Zener diodes, varactor diodes, optical diodes, and other types of diodes are covered. In addition, troubleshooting various types of diodes is covered, which involves probable identification and resolution of problems that may arise in diode circuits.					

Level	Second	Semester	Forth	Module	16
Module Code	Module Name in English			ECTS	
MIE209	Clinical Chemistry Techniques			6	
Class (hrs/week)	Lect /Lab. /Prac. /Tutor		SSWL (hrs/week)	USWL (hrs/week)	
3	3		90	60	

Description
Learn how to analyses and detect chemical reactions occurring in the human body, as well as the importance and variety of chemical processes that occur there. The course's stated goal is to provide students with the knowledge necessary to identify the roles of the various clinical laboratory departments. Describe the laboratory's role in implementing a diagnosis. Comprehend the general principles and techniques underlying these endeavors. emphasise the fundamentals of clinical laboratory administration.

Level	Second	Semester	Third	Module	17
Module Code	Module Name in English			ECTS	
MIE205	Anatomy and Physiology			4	
Class (hrs/week)	Lect /Lab. /Prac. /Tutor		SSWL (hrs/week)	USWL (hrs/week)	
2	2		60	40	

Description
• Study and comprehend medical instruments by describing the physiological changes, especially the electrical ones, that occur when the various organs of the body perform their functions and their relationship to the instruments used to measure and diagnose various phenomena and diseases. • Understand the fundamentals of human physiology and their application to biomedical engineering. • Gain an understanding of the structure and function of all the different physiological systems of the body. • Obtain knowledge of biomedical engineering-related physiological measurements and instruments.

Level	Second	Semester	Third	Module	18
Module Code	Module Name in English			ECTS	
NTU201	English language			2	

Class (hrs/week)	Lect /Lab. /Prac. /Tutor	SSWL (hrs/week)	USWL (hrs/week)
2	0	30	20
Description			
This course aims to reinforce grammar concepts and tenses, increase vocabulary, improve speaking and writing skills, and consolidate and utilised acquired language abilities. Students will strengthen their understanding of grammar rules and tenses while expanding their vocabulary through a comprehensive review. Speaking practise will increase fluency and self-assurance, while writing practise will develop coherence and precision. The ultimate goal is to equip students with the ability to communicate effectively in English and demonstrate their knowledge on the final exam.			

Level	Second	Semester	Forth	Module	19
Module Code	Module Name in English			ECTS	
NTU200	Baath's Crimes in Iraq			2	
Class (hrs/week)	Lect /Lab. /Prac. /Tutor		SSWL (hrs/week)	USWL (hrs/week)	
2	0		30	20	
Description					

Level	Second	Semester	Forth	Module	20
Module Code	Module Name in English			ECTS	
MIE207	Logic Circuits			6	

Class (hrs/week)	Lect /Lab. /Prac. /Tutor	SSWL (hrs/week)	USWL (hrs/week)
3	3	90	60

Description

- Teaching students the basics of logical circuits that used in computers and electronic medical devices and how they work.
- Build simple digital circuits using truth tables and learn about them.
- Digital logic designers build complex electronic components that use both electrical and computational characteristics such as power, current, logical function, protocol, and user input.

Level	Second	Semester	Forth	Module	21
Module Code	Module Name in English			ECTS	
MIE208	Measurements and Medical Transducers			6	
Class (hrs/week)	Lect /Lab. /Prac. /Tutor	SSWL (hrs/week)		USWL (hrs/week)	
3	3	90		60	

Description

To learn about different types of electrical instruments for measurement and the methods by which precise results can be obtained, and to understand their fundamental components.

To identify medical transducers and study the characteristics of various transducer types and their applications, as well as the basic principles of measurement tools and their regular maintenance.

Level	Second	Semester	Forth	Module	22
Module Code	Module Name in English			ECTS	
MIE204	Engineering Mathematics			6	

Class (hrs/week)	Lect /Lab. /Prac. /Tutor	SSWL (hrs/week)	USWL (hrs/week)
6	0	90	60
Description			
Introduce advanced subjects in mathematics such as functions of multiple variables, integrals and multiple transformations, series and series, and a few other topics that have an impact on the study of engineering specialisation.			

Level	Second	Semester	Forth	Module	23
Module Code	Module Name in English			ECTS	
MIE306	Computer			3	
Class (hrs/week)	Lect /Lab. /Prac. /Tutor		SSWL (hrs/week)	USWL (hrs/week)	
1	2		45	30	
Description					

Level	Second	Semester	Forth	Module	24
Module Code	Module Name in English			ECTS	
MIE211	Electronic Circuits			7	

Class (hrs/week)	Lect /Lab. /Prac. /Tutor	SSWL (hrs/week)	USWL (hrs/week)
4	3	105	70

Description

The goal of this course outline is to give students a strong foundation in the fundamentals and practical applications of both bipolar junction transistors (BJTs) and field-effect transistors (FETs). The structure, properties, biassing, and amplification of transistors are all discussed. The course material discusses the differences between common-emitter, common-collector, and common-base amplifiers.
In addition, switching circuits and FET amplifiers are investigated. Students will be able to gain hands-on experience with transistor properties, biassing circuits, and amplifier circuits through the lab portion of the course.
The course is designed to teach students the fundamentals of working with transistors and their many applications in electronics.

Level	Second	Semester	Forth	Module	25
Module Code	Module Name in English			ECTS	
NTU203	Arabic Language			2	
Class (hrs/week)	Lect /Lab. /Prac. /Tutor		SSWL (hrs/week)	USWL (hrs/week)	
2			30	20	

Description

Level	Third	Semester	Fifth	Module	26
Module Code	Module Name in English			ECTS	
MIE301	Medical Diagnostic Instrumentation			7	
Class (hrs/week)	Lect /Lab. /Prac. /Tutor		SSWL (hrs/week)	USWL (hrs/week)	

4	3	105	70
Description			
Understanding the fundamentals of instrumentation and measurement techniques employed for all varieties of medical diagnostic equipment. Introduce students to the different types of diagnostic equipment used in hospitals and clinics, including X-ray machines, MRI machines, and Gamma cameras. Developing an understanding of the proper use and maintenance of equipment to ensure the accuracy and dependability of results. Understanding the principles of quality control and quality assurance in laboratory testing, as well as the validation and calibration of equipment. Developing instrument troubleshooting and problem-solving skills to ensure the accuracy and reliability of laboratory results. Understanding the significance of laboratory safety and regulatory compliance, including.			

Level	**Third**	**Semester**	**Fifth**	**Module**	**27**
Module Code	**Module Name in English**			**ECTS**	
MIE302	**Power Electronics**			**4**	
Class (hrs/week)	**Lect /Lab. /Prac. /Tutor**		**SSWL (hrs/week)**	**USWL (hrs/week)**	
2	**2**		**60**	**40**	
Description					
Understand the theory of electrical energy conversion using power electronic systems that perform AC/DC, DC/DC or DC/AC conversion. Understand operating principles and modulation strategies for single-phase and three phase diode rectifiers, as well as, switch-mode DC/DC power electronic converters and DC/AC inverters. Recognize, define, and analyze power electronic converters that perform AC/DC, DC/DC and DC/AC electrical energy conversions. Analyze the operating principles and modulation strategies for single-phase and three phase diode rectifiers, thyristor-based converters, as well as, switch-mode DC/DC power electronic converters and DC/AC inverters. Use instruments and equipment in the laboratory.					

Level	**Third**	**Semester**	**Fifth**	**Module**	**28**
Module Code	**Module Name in English**			**ECTS**	

MIE303	Signal Processing		6
Class (hrs/week)	Lect /Lab. /Prac. /Tutor	SSWL (hrs/week)	USWL (hrs/week)
3	3	90	60
Description			
1. To going on translating signal indication to formula. 2. To provide an actual description of system linearly. 3. To deal with linear equation instead of higher order differential equation. 4. To analyze system based on band. 5. To analyze analog signal to harmonics frequencies. 6. To synthesis module of system and signal from fraction.			

Level	Third	Semester	Sixth	Module	29
Module Code	Module Name in English			ECTS	
MIE304	Principles of Electronic Circuits			6	
Class (hrs/week)	Lect /Lab. /Prac. /Tutor		SSWL (hrs/week)	USWL (hrs/week)	
3	3		90	60	
Description					
To develop problem solving skills and understanding of circuit theory through the application of techniques. To understand voltage and current from a given circuit. This course also deals with the advance concept of electronic circuits. This is the basic subject for all electronic circuits. To understand Operational Amplifier, Active Filters, Voltage Regulator and Oscillator circuits. To perform Medical Electronic systems.					

Level	Third	Semester	Fifth	Module	30
Module Code	Module Name in English			ECTS	
MIE305	English Language			3	

Class (hrs/week)	Lect /Lab. /Prac. /Tutor	SSWL (hrs/week)	USWL (hrs/week)
3	0	45	30
Description			
This course aims to reinforce and expand upon advanced grammar concepts and tenses, improve vocabulary, develop speaking and writing skills, and consolidate learning through review and evaluation. The objective of the course is to strengthen students' comprehension of complex grammatical structures, such as subjunctive mood, phrasal verbs, complex sentence structures, causative verbs, conditionals, modal perfects, and reported speech. The emphasis of vocabulary development will be on articulating desires, hypothetical situations, regrets, and idiomatic expressions. Participation in group discussions and presentations, incorporation of advanced language structures, and use of cohesive devices will constitute speaking and writing practise. The course will conclude with a final exam that reviews and evaluates progress through listening assignments and the application of acquired language skills.			

Level	Third	Semester	Fifth	Module	31
Module Code	Module Name in English			ECTS	
MIE306	Computer			4	
Class (hrs/week)	Lect /Lab. /Prac. /Tutor		SSWL (hrs/week)	USWL (hrs/week)	
1	3		60	40	
Description					
The features of MATLAB as a programming language are taught to students. They are completely familiar with all MATLAB features and can operate the software with ease. Students are able to use MATLAB as a Simulink tool to solve mathematical problems and electrical circuits by constructing Simulink models. Understanding the graphical user interface and how to implement different designs by employing it.					

Level	Third	Semester	Sixth	Module	32
Module Code	Module Name in English			ECTS	
MIE307	Medical Diagnostic Imaging Systems			6	

Class (hrs/week)	Lect /Lab. /Prac. /Tutor	SSWL (hrs/week)	USWL (hrs/week)
3	3	90	60
Description			

Level	Third	Semester	Sixth	Module	33
Module Code	Module Name in English			ECTS	
MIE308	Communication Engineering			6	
Class (hrs/week)	Lect /Lab. /Prac. /Tutor	SSWL (hrs/week)		USWL (hrs/week)	
3	3	90		60	
Description					
Upon completion of this course, the student will be able to: Define signals and system. Define the main parts of AM and FM communication systems and their operation. Explain the types of signal modulation and sampling requirements of the signals. Characterize the noise types can occur in communication systems and methods of evading data loss. Familiar with wireless signals and antenna operation. Able to represent signal sampling, modulation and demodulation, and noise using MATLAB.					

Level	Third	Semester	Sixth	Module	34

Module Code	Module Name in English		ECTS
MIE309	Microprocessors		6
Class (hrs/week)	Lect /Lab. /Prac. /Tutor	SSWL (hrs/week)	USWL (hrs/week)
3	3	90	60

Description

Understand the fundamentals of microprocessors and the different types of addressing modes.
Demonstrate proficiency in utilising various addressing modes, including register addressing, immediate addressing, direct addressing, and more.
Apply programme-memory and stack-memory addressing modes in the Microprocessor 8086/8088.
Perform arithmetic operations, such as addition, subtraction, multiplication, and division (both unsigned and signed) using the microprocessor 8086 and 8088.
Implement logic instructions, shift/rotate instructions, and programme control instructions like jump, loop, and call instructions.
Gain knowledge of the hardware specifications, memory interface, and basic I/O interface of the 8086 and 8088 microprocessors.

Level	Third	Semester	Sixth	Module	35
Module Code	Module Name in English			ECTS	
MIE310	Digital Signal Processing			6	
Class (hrs/week)	Lect /Lab. /Prac. /Tutor	SSWL (hrs/week)		USWL (hrs/week)	
3	3	90		60	

Description

1. To going on describing formula numerically.
2. To provide a finite number of samples in time and frequency domain.
3. To deal with digital system.
4. To export and import data base in field of specialization.
5. To deal with the required rate of digital system.
6. To realize digital system model.

Level	Third	Semester	Sixth	Module	36
Module Code	Module Name in English			ECTS	

MIE311	Medical Electronic Systems		6
Class (hrs/week)	Lect /Lab. /Prac. /Tutor	SSWL (hrs/week)	USWL (hrs/week)
3	3	90	60
Description			

Level	Forth	Semester	Seventh	Module	37
Module Code	Module Name in English			ECTS	
MIE401	Medical Therapeutic Instrumentation			7	
Class (hrs/week)	Lect /Lab. /Prac. /Tutor		SSWL (hrs/week)	USWL (hrs/week)	
4	3		105	70	
Description					
Understanding the basic principles of instrumentation and measurement techniques used in all types of medical therapeutic machines. Familiarize students with the different types of therapeutic equipment used in hospitals, such as Artificial Kidney machines, Dental systems, Anesthetic units, etc. Developing an understanding of the appropriate use and maintenance of equipment to ensure accurate and reliable results. Developing skills in instrument troubleshooting and problem-solving in order to ensure accurate and reliable laboratory results. Understanding the importance of safety and regulatory compliance in laboratory settings, including the safe handling and disposal of hazardous materials.					

Level	Forth	Semester	Seventh	Module	38
Module Code	Module Name in English			ECTS	
MIE402	Medical Laser Systems			6	
Class (hrs/week)	Lect /Lab. /Prac. /Tutor		SSWL (hrs/week)	USWL (hrs/week)	
4	2		90	60	
Description					
Students will be taught how lasers are produced, what the components of a laser device are, what a laser beam is, and how it differs from regular light. Additionally, students will be introduced to some common types of lasers used in the medical field, how to transmit this beam through an optical fibre, and how to connect the transmitter with the optical fibre as well as the receiver. Finally, students will learn about some types of receptors as well as how to benefit from laser beams in the medical field.					

Level	Forth	Semester	Seventh	Module	39
Module Code	Module Name in English			ECTS	
MIE403	Digital Image Processing			6	
Class (hrs/week)	Lect /Lab. /Prac. /Tutor		SSWL (hrs/week)	USWL (hrs/week)	
3	3		90	60	
Description					
Give students the ability to know the structure of the different digital images. The course deals with image processing in the spatial domain. Introducing the histogram to decide image quality. To learn the pixel wise image processing techniques. To have a clear idea about image processing by using the filters for different applications. Having an introduction to Discrete Wavelet Transform (DWT). Having knowledge about image compression as a coding procedure.					

Level	Forth	Semester	Seventh	Module	40
Module Code	Module Name in English			ECTS	
MIE404	Research Methodology			3	
Class (hrs/week)	Lect /Lab. /Prac. /Tutor		SSWL (hrs/week)	USWL (hrs/week)	
3	0		45	30	
Description					
Research methodology provides instruction about biomedical engineering research. In the course, students will develop research questions, choose study designs, and use quantitative and qualitative data collection methods. Data manipulation and visualisation software will provide students with data collection, analysis, and statistical inference. Research principles, literature review methods, scientific writing, and project management will be covered. By the completion of the course, students will be able to perform thorough and ethical biomedical engineering research, interpret findings, and share their work.					

Level	Forth	Semester	Seventh	Module	41
Module Code	Module Name in English			ECTS	
MIE405	Object Oriented Programing			4	
Class (hrs/week)	Lect /Lab. /Prac. /Tutor		SSWL (hrs/week)	USWL (hrs/week)	
1	3		60	40	
Description					
• Understand the principles and advantages of OOP in Python • Differentiate between classes and objects • Define attributes and methods within a class • Apply encapsulation techniques to hide data and implementation details • Create and use getter and setter methods • Understand the concept of data abstraction and its benefits • Implement inheritance to create hierarchies of classes • Utilize polymorphism to write code that operates on objects of different classes • Handle exceptions in object-oriented programs • Implement custom exception classes • Understand the importance of error management in OOP • Apply OOP concepts and techniques to a real-world project • Design and develop a software solution using OOP principles					

Level	Forth	Semester	Sevine	Module	42
Module Code	Module Name in English			ECTS	
TEMO 400	Project 1			4	
Class (hrs/week)	Lect /Lab. /Prac. /Tutor		SSWL (hrs/week)	USWL (hrs/week)	
0	4		60	40	
Description					
Course Project objectives in medical instrument engineering include applying knowledge and skills to real-world problems, integrating concepts from different areas of biomedical engineering, conducting research and investigation, developing problem-solving skills, and designing and implementing medical devices within the available capabilities. encouraging collaboration and cooperation, enhancing project management skills, enhancing communication and presentation abilities, addressing ethical concerns, and promoting reflection and continuous improvement.					

Level	Forth	Semester	Eighth	Module	43
Module Code	Module Name in English			ECTS	
MIE407	Radiation Engineering in Medical Applications			7	
Class (hrs/week)	Lect /Lab. /Prac. /Tutor		SSWL (hrs/week)	USWL (hrs/week)	
4	3		105	70	
Description					

- Understanding Radiation Physics: One of the primary objectives of studying Radiation Engineering in Medical Sciences is to gain a comprehensive understanding of the fundamental principles of radiation physics. This includes topics such as the nature of radiation, its properties, interaction with matter, and the behavior of radiation in medical applications.
- Radiation Safety and Protection: A crucial aspect of studying Radiation Engineering in Medical Sciences is to develop expertise in radiation safety and protection measures. This involves learning about the potential hazards of radiation exposure, implementing appropriate safety protocols, and understanding the principles of shielding and containment to ensure the well-being of both patients and healthcare professionals.
- Medical Imaging Techniques: Another objective is to explore various medical imaging techniques that employ radiation, such as X-ray radiography, computed tomography (CT), positron emission tomography (PET), and single-photon

emission computed tomography (SPECT). Students will learn about the principles, equipment, image acquisition, and interpretation methods for each modality.

- Radiation Therapy: Radiation therapy plays a critical role in the treatment of cancer. By studying Radiation Engineering in Medical Sciences, students aim to develop expertise in the principles and techniques of therapeutic radiology. This includes learning about treatment planning, dose calculation, radiation delivery systems, and the biological effects of radiation on cancer cells.
- Radiation Dosimetry: Accurate measurement and calculation of radiation doses are essential in medical applications. The objective of studying Radiation Engineering in Medical Sciences is to acquire knowledge and skills in radiation dosimetry, which involves understanding different dosimetric techniques, radiation measurement devices, and methods for calculating and verifying radiation doses in medical procedures.
- Radiation Biology: To comprehend the effects of radiation on living organisms, students studying Radiation Engineering in Medical Sciences will explore radiation biology. This field covers topics such as radiation-induced biological damage, cellular and molecular responses to radiation, radiation effects on tissues and organs, and radiation-related risks and complications.
- By achieving these objectives, students studying Radiation Engineering in Medical Sciences can contribute to the safe and effective use of radiation in medical applications, improve patient care, and advance the field through research and innovation.

Level	Forth	Semester	Eighth	Module	44
Module Code	Module Name in English			ECTS	
MIE408	Artificial Intelligence			6	
Class (hrs/week)	Lect /Lab. /Prac. /Tutor		SSWL (hrs/week)	USWL (hrs/week)	
2	4		90	60	
Description					

1. Studying fundamentals of artificial intelligence.
2. Presenting principles of machine learning.
3. Explaining artificial neural networks.
4. Explaining deep learning.
5. Illustrating fuzzy logic.
6. Describing optimization methods.

Level	Forth	Semester	Eighth	Module	45
Module Code	Module Name in English			ECTS	
MIE409	Control Systems			6	
Class (hrs/week)	Lect /Lab. /Prac. /Tutor		SSWL (hrs/week)	USWL (hrs/week)	
3	3		90	60	
Description					
• Understand the fundamentals of control systems: This objective involves gaining knowledge about the basic principles and concepts of control systems, including feedback, open-loop and closed-loop control, control algorithms, and system dynamics. • Learn about Programmable Logic Controllers, their architecture, and their role in industrial automation and medical applications. Understand the advantages and applications of PLCs in control systems.					

Level	Forth	Semester	Eighth	Module	46
Module Code	Module Name in English			ECTS	
MIE410	English Language			3	
Class (hrs/week)	Lect /Lab. /Prac. /Tutor		SSWL (hrs/week)	USWL (hrs/week)	
3	0		45	30	
Description					
• Enhancement of Skills: Enhance reading, listening, speaking, and writing abilities through targeted practise exercises and strategies. • Development of Vocabulary and Grammar: Increase vocabulary and refine grammatical accuracy in order to effectively communicate ideas and demonstrate language proficiency in both spoken and written tasks. • Speaking Proficiency: Develop fluency, coherence, and confidence in spoken communication by practising brief introductions, responding to prompts, delivering prepared talks or classes, and engaging in abstract topic discussions. • Exam-Specific Methods for the IELTS and TOEFL: Learn time management techniques, test-taking strategies, and techniques for maximising performance, minimising errors, and demonstrating proficiency in each exam section.					

Level	Forth	Semester	Seventh	Module	47
Module Code	Module Name in English			ECTS	
MIE405	Engineering Management			4	
Class (hrs/week)	Lect /Lab. /Prac. /Tutor		SSWL (hrs/week)	USWL (hrs/week)	
4	0		60	40	
Description					
This course aims to provide students with an understanding of the principles and practices of engineering management. Students will learn about the structure and organization of hospitals, healthcare financing, and reimbursement, healthcare laws and regulations, patient safety, and quality improvement. The course will also cover the role of technology in hospital administration management, including biomedical engineering applications. Course Objectives: • Understand the structure and organization of hospitals • Understand healthcare financing and reimbursement • Understand healthcare laws and regulations • Understand patient safety and quality improvement • Understand the role of technology in hospital administration management					

Level	Forth	Semester	Eighth	Module	48
Module Code	Module Name in English			ECTS	
TEMO 401	Project 2			4	
Class (hrs/week)	Lect /Lab. /Prac. /Tutor		SSWL (hrs/week)	USWL (hrs/week)	
0	4		60	40	
Description					
Course Project objectives in medical instrument engineering include applying knowledge and skills to real-world problems, integrating concepts from different areas of biomedical engineering, conducting research and investigation, developing problem-solving skills, and designing and implementing medical devices within the available capabilities. encouraging collaboration and cooperation, enhancing project management skills, enhancing communication and presentation abilities, addressing ethical concerns, and promoting reflection and continuous improvement.					

3. Contact Information

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